Inquiry-Based Pedagogy for Inclusive Classrooms

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INQUIRY-BASED PEDAGOGY FOR INCLUSIVE CLASSROOMS

Abby McKimm

December 2021

APPROVED

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Abstract

Inquiry-based learning is a popular topic in today’s mainstream classrooms due to increasing student needs and the push to create more inclusive classrooms. This thesis explores the benefits of inquiry-based learning and inclusive classrooms. Inquiry-based learning teaches students important skills that traditional curriculums do not teach unless intentional modifications are made to the curriculum. Skills such as communication, organization, problem-solving and problem posing, tolerance, grit, self-efficacy, how to make connections, apply new learning, attentive listening, and research skills are all developed during inquiry-based learning experiences. Inclusive classrooms are necessary for students to learn to collaborate with people who think and behave differently than them. Ultimately, using inquiry to create an inclusive learning environment allows students to choose their learning path and teachers to differentiate instruction, which increases overall engagement in school.
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CHAPTER I: INTRODUCTION

We, as educators, are called to this profession for a variety of reasons. Perhaps we had a wonderful teacher who inspired us to become just like them or we had a poor teacher who motivated us to never be like them. Maybe we wanted to be part of the development of the next generation or we simply enjoy working with students and want to make a career out of our passion. There are many reasons we are called to the profession, and there is no one educator who has all the answers or strategies to most effectively educate our children. Nonetheless, at the heart of every great educator is the determination to help students using the best methods we know.

21st-century classrooms are diverse environments with students of different talents, cultures, genders, and experiences. 21st-century teachers are equipped with student-centered pedagogy, prepared to meet the needs of all learners, and create a culture of inclusion and acceptance among students. We have an important responsibility to ensure all students are academically, socially, and emotionally prepared for experiences beyond the classroom, but a common question is what strategies are most effective in preparing our students for careers and schooling after high school?

When I first began teaching, I was naïve and did not realize the impact I had on all students. I simply followed the curriculum manuals and state standards without considering how to effectively differentiate and engage English learners, students in special education, gifted learners, and mainstream students. I thought that I could just use the manuals and workbooks provided and my students would learn, but I was completely wrong. I soon realized that my methods were not working and that I needed to innovate
by creating an environment where all students felt a sense of belonging and success. I
turned to my students’ English language teachers for help and created a classroom where
most of the interventions students received were in the mainstream classroom.
Unfortunately, not all schools have a similar philosophy and not all teachers have the
flexibility to “push-in” to the mainstream classroom to support their students. Yet, as our
student populations develop, we, as teachers, must continue to challenge traditional
educational methods and work towards inclusive education for all.

**Inclusion in the United States**

Under the Individuals with Disabilities Education Act, students with disabilities
are required to be educated with individuals who are not disabled. Only when the severity
of the disability and classroom modifications and adaptations prevent a student from
learning in the mainstream classroom, should the student be removed from the class
(United States Department of Education, 2021). This has not always been the case, and
inclusion law in the United States has progressed from students with disabilities being
institutionalized and isolated from the rest of society to being fully immersed in the
mainstream classroom (Bae Francisco et al., 2020).

**Constructivism and Inquiry-Based Classrooms**

Educational theorists including Jean Piaget and John Dewey, as well as current
educators, have been trying to determine the best strategies and educational environments
all students can be successful in. With evidence that supports inclusive classrooms and
inquiry-based pedagogies as effective in preparing students with 21st-century skills such
as communication, collaboration, and problem-solving, educators should implement these
innovative instructional methods to best meet the needs of all learners. Inquiry-based learning can be used to supplement curriculum and create real life experiences that students gain a variety of skills from (Song, 2018).

Dewey’s theory of constructivism suggests giving students ample opportunities to engage in real life, social experiences that teach independence (Gershon, 2021). Piaget reinforced the idea that learning is interconnected and that students benefit from finding commonalities between learning experiences (Piaget, 1964, 1972). In a traditional classroom setting students listen to a lecture, practice the skill, and take an assessment. While not always bad, this method of teaching does not challenge students to apply problem-solving or collaboration skills to their learning. Rather, current research suggests that inquiry creates an inclusive, positive, student centered learning environment that all students can be successful in while preparing students for more challenging learning experiences in and out of school (Ashman et al., 2020; Barone & Barone, 2019; Borovay et al., 2019; Callahan et al., 2015; Coffman, 2017; DeMink-Carthew & Netcoh, 2019; Divrik et al., 2020; Early & Kendrick, 2020; Kamal & Suyanta, 2021; McGrath & Hughes, 2018; Rosengrant et al., 2021; Song, 2018; Suto, 2020; Ülger & Çepni, 2020; Yun et al., 2018). Dewey argued that education is about connecting real experiences to curriculum and preparing students to live in a complex society (Gershon, 2012). Dewey’s theory can be seen in today’s classrooms through inquiry-based learning and experiential learning opportunities.

Educational theorist and Swiss psychologist Jean Piaget believed that learning is interconnected, reinforcing Dewey’s learning theory of constructivism and that students
learn by doing, or through experimentation. Piaget also (1964,1972) suggests that the most fundamental factor of learning is equilibration, or the ability to formulate conclusions based on observation, calculation, and a synthesis of learning, which is the final step of the inquiry process.

A benefit to inquiry-based learning is that it provides classroom teachers an educational practice, supported by Dewey and Piaget, that connects learning to real experiences. Inclusive inquiry-based classrooms expose students to rich learning experiences that do not limit them, but rather use their abilities to enhance the learning for all students. In today’s rapidly changing world, inclusive teachers need to prepare students to be productive problem solvers, critical thinkers, and flexible collaborators. Tomlinson and Javius (2012) argue that students can out-perform our expectations for them when given opportunities to engage in personalized, student-driven learning, and inquiry-based learning does just that. Inquiry-based learning engages all students in content that is meaningful, culturally relevant, and interesting to them (Dack & Tomlinson, 2014).

**Definition of Terms**

Throughout this thesis, the following terms will be used frequently: inquiry-based learning, inclusion, mixed ability, mainstream, general education, differentiation, individualized educational plan, students in special education, culturally and linguistically diverse students, gifted students, and twice exceptional students. Understanding these terms will provide a context for the literature in this thesis.
Inquiry-based learning (IBL) can be identified as exploratory, active, or experiential learning. IBL is student-centered and exposes them to real-world experiences (Dack & Tomlinson, 2014). IBL begins with a question, problem, or scenario that individual or groups of students try to solve. From there, students either conduct an experiment or complete research to answer the question or solve the problem and scenario. Once the experiment or research is complete, students present their findings (Coffman, 2017). This entire process can be completed with or without teacher guidance (Lazonder & Harmsen, 2016; Hushman & Marley, 2015; Ashman et al., 2020).

Inclusion is the act of accepting all individuals in a school setting despite their race, disability, gender, and medical needs. Inclusive classrooms embrace differences and accept all students no matter their needs (Bae Francisco et al., 2021). Inclusive classrooms can also be identified as mixed ability classrooms. In mixed ability classrooms, all students work towards achieving high learning standards and the teacher uses differentiation techniques to meet all students’ needs (Krämer et al., 2020; Tomlinson & Javius, 2012). In inclusive classrooms, all students are considered general education students where grade level instruction is delivered. Similarly, inclusive and mixed ability classrooms can be considered mainstream classrooms because grade level instruction and standards are provided to all students (United States Department of Education, 2021). Traditionally, students in mainstream classrooms have a variety of learning needs, but specific learning needs for certain populations of students are met outside of the general education setting. Prior to inclusive classrooms, students in special education, culturally and linguistically diverse students, gifted students, and twice
exceptional students left the general education classroom to meet with specialists, interventionists, and teachers who are specifically trained to teach those students (Bae Francisco et al., 2021).

An individualized education plan (IEP) is a plan created for a child with a disability that requires, by law, students to receive specialized, differentiated instruction. Educational, social, and emotional goals are also established at yearly IEP meetings for students to ensure that growth occurs, and that students’ needs are being met. All teachers who work with a student who has an IEP are required to learn what their role is in supporting this student and meeting the IEP goals (Reis, 2014). Students in special education (SPED) have an IEP and can have a variety of diagnoses including physical, developmental, and behavioral or emotional disabilities. Students in SPED must have a disability or disabilities that adversely impact educational achievement (United States Department of Education, 2021).

Culturally and linguistically diverse students (CLD), also known as English learners (EL), are students who come from a home environment where English is not the first language spoken. In addition, these students can come from different ethnic backgrounds, nationalities, religious practices, traditions, and social structures. Students who are born in the United States can also be considered CLD students and ELs because the first language spoken at home is not English (United States Department of Education, n.d.).

Gifted students or students in gifted and talented (GT) programs perform or have the capability to perform at higher levels compared to students of the same age or grade
level (Callahan et al., 2015; Peters et al., 2020; Redding & Grissom, 2021). Gifted students can have high intellect ability, or be highly creative, artistic, musical, or have strong social and emotional skills (Barone & Barone, 2019). Gifted students can be identified through exams, teacher recommendations, and continued high academic performance.

Twice exceptional (2e) students are identified as gifted and have a learning or developmental disability. They are highly intelligent students but can find school challenging due to social and emotional challenges or a physical disability. These students are difficult to identify as gifted due to their disability or difficult to identify as special education due to their high academic performance level (Callahan et al., 2015; Reis, 2014).

**Research Questions**

In the literature review, the following questions will be answered: How does inquiry-based learning create an inclusive classroom for all learners? What is inquiry-based learning and an inclusive classroom? How does inquiry benefit English language learners, students in special education, mainstream classroom students, and gifted learners? How do inclusive classrooms impact all students? Although the review will focus primarily on the benefits of inquiry-based learning and strategies, it is important to also consider the limitations of the practice.
CHAPTER II: LITERATURE REVIEW

Literature Search Procedures

A review of literature related to inquiry-based learning for mixed-ability classrooms will be shared in Chapter Two. It will describe inquiry-based learning and mixed-ability classrooms, discuss how inquiry-based learning impacts all students in the general education classroom, explore how inquiry can be used to differentiate instruction and share limitations of the pedagogy practice. The literature reviewed was located by using searches of ERIC, Academic Search Premier, EBSCO MegaFILE, and PsycINFO with publication dates of 2008-2021. The searches were narrowed by using the following keywords: “inquiry or active learning”, “inquiry or active teaching or strategies”, “inclusive or mainstream elementary classrooms”, “inquiry learning motivation”, and “differentiation strategies in elementary classrooms”. The structure of this chapter is to review the literature on inquiry-based learning for mixed-ability classrooms in this order: guided and unguided inquiry-based learning, mixed-ability classrooms, effects of inquiry-based learning, and limitations of inquiry-based learning.

Inquiry-Based Learning

Inquiry-based learning (IBL), otherwise known as active, discovery, or experiential learning, is a pedagogical approach that involves students in the process of learning through questioning, research, and in some cases, testing. IBL can include science experiments or research projects that follow scaffolding models including guided and unguided inquiry. Guided inquiry is similar to a science experiment, while unguided inquiry is research based. In both types, IBL begins with an essential question or topic
and provides students the opportunity to further investigate and report new learning. IBL gives students the chance to explore topics they might not otherwise have the opportunity to learn about and choose how they pursue learning, naturally increasing engagement and investment in learning (Dack & Tomlinson, 2014). Educator Teresa Coffman (2017) describes the steps of the inquiry process as asking questions, discovering answers, presenting findings, and exploring options. The process repeats as students learn more about the topics they are researching or testing, and as students formulate new questions. Coffman (2017) also encourages teachers and students to provide feedback to each other to ensure understanding and to connect to new learning.

**Guided inquiry.** Although both types of inquiry, guided and unguided, are teacher-led until all students understand what to expect during the inquiry process and begin to develop the necessary skills to be productive inquirists, guided inquiry continues to be initiated by the teacher throughout all steps. The teacher delivers instruction, guides students throughout the entire research portion by providing resources, scaffolds as students compile their findings, and guides the discussion about exploring more research options. Unlike a research-based inquiry project, guided inquiry can also be similar to a science lesson. For example, students and teachers work together to create the strongest and tallest skyscraper possible, test their skyscraper, and modify the skyscraper together.

Lazonder and Harmsen (2016) hypothesized that guided inquiry learning leads to more proficient use of inquiry skills than unguided inquiry. They found that the teacher plays a vital role in providing students with just the right amount of support to use the inquiry process productively. Inquiry guidance should allow students to accomplish the
task and learn from the activity while enabling students to take risks. Lazonder and Harmsen (2016) used the example of a mathematics teacher to describe what this looks like. They share that a math teacher does not direct students in every step of the mathematical process, but rather a math teacher prompts student thinking with questions and leads them to discover the answer. Similarly, teachers can direct students through every step of a science experiment, but until students actually have the opportunity to apply their inquiry skills, they will not be able to authentically apply their learning in new situations. Inquiry engages students in investigative work and enables students to learn how to be problem-solvers while creating a personalized learning environment for all types of learners.

**Benefits of guided inquiry.** Lazonder and Harmsen (2016) report that students benefit from a range of guidance depending on their skill level and the purpose of the inquiry project. More specifically, guidance that gives students enough freedom to examine a topic on their own was determined to be more effective than highly specific guidance that replaced the practice of inquiry with direct instruction about a topic.

In a longitudinal study of undergraduate students, 17 individuals used Tobii Eyeglasses, a portable eye tracker, to record student eye movement during class. The goal of the study was to determine if guided inquiry versus traditional lecture instruction was more effective at keeping students on task and focused on the instructor rather than looking around the classroom or at other students’ computers. The results of the study were profound. On average, throughout the five semesters the study was conducted,
students stayed on task 90 to 95% of the time when the instructor used guided inquiry to deliver content (Rosengrant et al., 2021).

Likewise, in an elementary school, Hushman and Marley (2015) sought to determine if instructional strategies such as minimal, guided, and direct instruction impact student learning. In addition, they wanted to learn if those instructional strategies change students’ self-efficacy related to science.

Sixty 9 and 10 year olds were enrolled in a classroom-based science summer camp and participated in the study. Students were randomly assigned to an instructional strategy group including direct, guided, and minimal instruction. The direct instruction group received content through teacher provided examples. The guided instruction group was given prompts and students provided explanations. The minimal instruction group participated in self-discovery learning activities. At the end of the study, students were evaluated on their ability to design experiments, participate in cued recall, and apply and evaluate science concepts. In addition, the science self-efficacy questionnaire was administered before and after the camp.

At the conclusion of the study, the guided instruction group outperformed the minimal and direct instructional groups for experiment design. Furthermore, students in the guided instruction group accurately designed more experiments than participants who receive direct or minimal instruction.

Hushman and Marley (2015) also determined that guided instruction increased students’ ability to answer cued-recall questions more accurately than participants who received minimal instruction. On the other hand, students who received direct instruction
did not perform better or worse than the guided instruction group on cued recall. The same result occurred on the application and evaluative questions. Participants who received guided instruction had the greatest change in science self-efficacy from before and after the camp leading to the conclusion that guided inquiry is the most effective way to increase student confidence.

Ashman et al. (2020) investigated the effectiveness of a problem-solving first pedagogy approach as opposed to full guidance at the start of the lesson. Sixty-four 10-year-olds, who had not received prior instruction in the conservation of energy or energy efficiency, participated in the study. Students were randomly assigned to the problem-solving first or explicit instruction group. Both groups of students were asked to solve problems using data on the energy taken in and out per second by different light globes. Students could find the efficiency of each type of globe by computing the useful light energy given out as a proportion of the electrical energy taken in. Students were given a problem-solving booklet with similar problems, a simple calculator, and reading materials related to energy. Each question became increasingly more difficult than the previous one as students progressed through the problem set. In addition, for the explicit instruction phase of the trial, teachers were given a PowerPoint to use with the booklet work. The problem-solving first group was given 15 minutes to attempt the booklet problems and told to try the problems, but completing the booklet was not expected. After the time was up, learners in both groups received 25 minutes of interactive explicit instruction for how to solve the booklet questions. The instruction was interactive with the teacher performing calculations alongside students. Next, the explicit instruction
group was given the booklet to solve whereas the problem-solving first group was given the reading material. Six days later, students in both groups completed the post-test which consisted of six questions similar to the booklet and five transfer questions that were similar to the booklet questions but required additional steps to find the solution.

In the end, learners in the explicit instruction group scored significantly higher on the post-test versus the problem-solving first group. Ashman et al. (2020) discuss that for highly specific work like mathematical computations, specific guidance is needed and is a more effective instructional approach as opposed to problem-solving first and then lecture. Overall, guided inquiry promotes positive behavior in students like the ability to stay on task and have confidence in their abilities in addition to being able to perform academic tasks as proven by Hushman and Marley’s (2015) study.

Unguided inquiry. Although guidance is an important part of the inquiry process, giving students the freedom to engage in unguided inquiry is just as important as students benefit from choice. DeMink-Carthew and Netchoh (2019) argue that student voice and choice are vital in responding to young adolescents’ developmental need for autonomy in school. Unguided inquiry supports this goal because it increases responsibility and creates personalized, meaningful learning opportunities for students.

When learners are in the process of unguided inquiry, teachers take a hands-off approach and focus on how to facilitate the inquiry process through questioning and positive encouragement rather than telling students what to specifically do. During unguided inquiry, students are responsible for setting their own learning goals, completing the research, and reporting their findings. Although unguided inquiry requires
students to be responsible for their learning, teachers still plan lessons that meet state standards, support students through the inquiry process, and reinforce inquiry skills such as questioning, investigating, synthesizing, and collaborating, but do not provide specific guidance unless students need that support.

**Benefits of unguided inquiry.** In unguided inquiry, students learn how to problem solve, cope, and advocate for themselves, while the teacher facilitates the inquiry process. Song (2018) writes that in order for students to be prepared for the 21st century, technology-rich learning environments, they need to learn how to navigate formal and informal problems. In addition, students need to be able to communicate for themselves.

Song (2018) provides rationale for unguided inquiry, otherwise referred to as productive failure instructional design. Two six grade classes with 26 and 27 students, respectively, between the ages of 12 and 13 participated in a study about the effect of productive failure instructional design on students’ collaborative problem-solving competency. Both classes completed the inquiry project about plant adaptations, but Class 1 received the productive failure, or unguided, instructional design, and Class 2 received guided inquiry instructional design. Both classes followed the following inquiry steps: explore and understand, represent and formulate, plan and execute, and monitor and reflect. Once students completed the inquiry project, they were evaluated on overall collaborative problem-solving competency, a domain-specific pretest, and posttest, and the result of one group’s collaborative problem-solving process from each class to compare and contrast unguided to guided inquiry.
The results of the study indicate that students who participated in Class 1, productive failure, demonstrate higher scores on the collaborative problem-solving competency assessment than students who were in Class 2. In addition, Class 1 scored higher on the domain-specific tests increasing from 3.25 to 4.07, whereas Class 2 scored 3.15 and 3.19. Song (2018) argued that Class 1 had a better overall conceptual understanding of plant adaptations because of the nature of the inquiry project and student commitment to learning about the topic. In this case, unguided inquiry proved to be an effective means to deliver content despite many studies arguing that guided inquiry is more effective in increasing academic performance.

**Mixed-Ability Classrooms**

Inclusive education is a widely debated topic among educators. Some teachers support full inclusion of mixed-ability students while others believe students who receive special education (SPED) services or English learner (EL) services need to be placed in an alternative classroom for part of the day. Furthermore, teachers can be limited in their ability to reach gifted students in a general education setting with the amount of neurodiversity in one classroom.

Full inclusion means that students participate in all classroom activities no matter their abilities. Even though students have different learning needs, all students deserve to receive an equitable education alongside their peers whether they have an individualized educational plan, receive intervention services, or perform above their peer group. Jackson et al. (2008) suggest that richer learning might even occur when children with differing abilities collaborate to solve challenges together, improving school
community and schoolwide commitment to educating all students in the general education setting.

**Students in Special Education**

In the state of Minnesota, 61.2% of students with disabilities receive instruction 80% of the school day, or more, inside the general education classroom. Twenty-three percent of students with disabilities receive instruction in the general education classroom 40 to 79% of the day (U.S. Department of Education, as cited in National School Boards Association, CPE, 2020). As the number of times students who receive special education services are placed in the mainstream classroom increases, teachers need to be prepared to meet the needs of all learners. One way to do that is through inquiry learning while maintaining the integrity of the individual educational plan and student.

**Benefits of inclusion of students in special education.** Jackson et al. (2008) found that special education services can be provided in the general education classroom with more success than in a self-contained setting and that those services do not hinder the success of other students in the classroom. Krämer et al. (2020) wanted to determine the effects of inclusive education on students with general learning difficulties whose IQ score falls between fifty and ninety. In addition, the researchers wanted to find out how psychosocial factors influence student self-concept, social integration, and possible test anxieties. Six thousand one hundred nineteen students with a general learning difficulty (GLD) were included in the analysis along with 5, 868 students without a GLD. Students ranged from ages 6 to 16 and were either in elementary or secondary school. The authors concluded that inclusive classrooms are academically beneficial for students in special
education as the results of the study found that students with a GLD outperformed other students with a GLD in segregated settings. There was no difference between the inclusive and segregated groups in regard to psychosocial outcomes for students with a GLD and for students without a GLD. Students with a GLD cognitively benefit from inclusion settings likely due to a more stimulating learning environment and a greater emphasis on student performance. Neither group of students, those with a GLD or without, suffered academically or socially in the inclusive setting.

Kart and Kart (2021) also found that students without disabilities benefited from an inclusive environment as a reduction of fear, hostility, prejudice, and discrimination were prevalent amongst general education students in their review. The more contact general education students had with students with special needs, the more likely they were to associate positive feelings and gestures toward those students. Inclusive classrooms do not hinder the learning of mainstream students, nor do they negatively impact the social-emotional health of students in special education. More so, inclusive classrooms positively impact all students socially and academically, especially for those in special education.

Cole et al. (2021) compared academic outcomes of students placed in general education classrooms for 80% or more of the school day to students placed in general education classrooms for less than 80% of the day. The authors wanted to prove whether students have better academic outcomes with more inclusive educational placements than less inclusive placements.
Students in Grades 3 through 8 were considered for this study and were categorized into low or high inclusion based on least restrictive environment assignments (LRE). Since LRE is not randomized, student individualized educational plans were considered and a random treatment design was not used to investigate the research question. Rather, a propensity score, or the likelihood a participant is assigned to a treatment condition like LRE, was used to recreate a randomized experiment.

The intervention group, students placed in the general education setting for more than 80% of the day, and the comparison group, students placed in the general education setting for less than 80% of the day, had approximately the same average tests scores and percentage of demographics creating unbiased outcomes. In addition, students in low and high inclusion environments were matched based on their primary disability, a standardized reading tests called IRead, Indiana State Test of Educational Progress, third-grade attendance records, student race and ethnicity, gender, suspension or expulsion history, and free and reduced lunch status, creating comparisons between students in high and low inclusion settings. The number of eligible students for the English language arts (ELA) portion of the study was 1,619 students with 63 who were considered in the low inclusion group. For math, 1,669 students were eligible with 75 students in the low inclusion group. Since the number of students in the high inclusion group is much greater than the low inclusion group of approximately 24 to 1, matching high inclusion to low inclusion students could be very precise, or within 0.1 standard deviations of each other based on the criteria above.
Cole et al. (2021) found that in all comparisons, students benefited from inclusion for 80% or more of the school day in ELA and math based on standardized test scores. A minimum estimated difference of 15.67 points was found to favor high inclusion on an ELA standardized test in sixth grade and a maximum difference of 27.32 to favor high inclusion in seventh grade. For math, a minimum estimated difference of 19 points was found to favor high inclusion on a standardized test in sixth grade and a maximum difference of 34 points to favor high inclusion in seventh grade.

**Culturally and Linguistically Diverse Students**

In addition to mainstream classrooms serving students in special education, they are also serving culturally and linguistically diverse (CLD) students. In Minnesota, there were 76,361 students identified as English learners (EL) in 2020, a 2.3% increase from 2019 (Minnesota Department of Education, 2021). In the United States, over 4,800,000 students were enrolled in EL programs for the 2014-2015 school year, which was 10% of the total school population (United States Department of Education, n.d.). School districts are responding to growing diversity by implementing equity-focused professional development and culturally relevant teaching, which benefits CLD students.

**Benefits of inclusion of culturally and linguistically diverse students.** Qianqian (2017) studied a fourth-grade classroom teacher’s individual efforts and beliefs about educating CLD students. Ms. B was considered a proficient educator in the area of CLD pedagogy. Seventy percent of Ms. B’s 25 students spoke Spanish as their home language. In interviews with Ms. B, Ms. B expressed that she is a role model for all of her students and an advocate for student-centered CLD pedagogy. Ms. B described this type of
pedagogy as innovative, technology-focused, student-centered, and supportive. CLD pedagogy is similar to inquiry-based learning. Ms. B’s students were encouraged to select the topics they wanted to learn about and decide how to express their learning. CLD pedagogy promotes inclusiveness for all learners, just as inquiry-based pedagogy supports CLD students in the mainstream classroom.

CLD students require teachers to be innovative and research-based practitioners. In addition, CLD students bring a unique dynamic to the mainstream classroom with the variety of values and cultural norms they possess. Although Els often experience lower academic achievement, especially on standardized tests, Whiteside et al. (2017) report that bilingual students experience less social-emotional difficulties than monolingual students, that language proficiency also impacts social-emotional health. Likewise, Suto (2020) found that peer mentoring, or pairing students of different home languages together, builds classroom inclusion and cultivates feelings of belonging and safety at school. Lastly, peer mentoring promotes language acquisition through the use of social and collaborative learning opportunities, like inquiry-based learning.

Similar to Whiteside et al. (2017) learning that Els can have strong social and emotional regulation skills depending on language development, Yun et al. (2018) found that students with certain learner characteristics such as self-efficacy, self-regulation, and persistence have more academic buoyancy, or the ability to positively respond to setbacks or challenges in educational settings. Participants in the study were 757 college-level English learners who attended both private and public colleges. Although the language
proficiency levels of the participants were different, all students participated in a single-semester, credit-bearing English course taught by native English speakers.

Yun et al. (2018) wanted to find out what predictors, self-efficacy, self-regulation, persistence, student-teacher relationship, anxiety, and ideal English-speaking self (L2 self), most strongly influence academic buoyancy. Students completed a six-point response scale questionnaire ranging from strongly disagree to strongly agree and a standardized English exam.

Of the 757 students who participated in the study, 16.4% possessed high levels of self-efficacy and the ability to strategically self-regulate their learning experiences. In addition, these students reported productive relationships with their teachers and reported the lowest level of anxiety. Yun et al. (2018) identifies this group as the thriver profile. Thirty-two and eight tenths percent of students reported high levels of self-efficacy and strategic self-regulation while having moderate levels of anxiety. These students also reported having a close relationship with their English teacher and were considered part of the engaged profile. Next, 30.3% of students were named the striver profile for reporting medium levels of self-efficacy, average levels of strategic self-regulation, moderate levels of L2 self, and above-average anxiety with indecisive feelings about the relationship with their teacher. The dependent profile, or learners with the lowest level of self-efficacy and strategic self-regulation, made up 15.7% of students and reported the highest anxiety and poor levels of L2 self. Lastly, 4.8% of students marked the lowest levels of anxiety and self-regulation, modest levels of self-efficacy, and poor
relationships with their English teacher. This group is categorized into the disengaged profile.

The results of the questionnaire and standardized English test indicate that highly buoyant students like those of the thriver and engaged profiles exhibit the highest levels of academic achievement and made up approximately 50% of the participants. Self-efficacy, self-regulation, and the teacher-student relationship impact how students adjust their thinking, expectations, and adapt to changing situations. Els thrive in positive environments that support their language, social, and emotional development. Inquiry-based classrooms create this type of environment by allowing teachers to build relationships with their students and student to develop socially and emotionally.

**Students in Gifted and Talented and Twice-Exceptional Students**

Gifted and talented (GT) and twice exceptional (2E) students are also prevalent in today’s mainstream classrooms. To be considered “gifted” varies from district to district. Some schools require students to meet a certain mark on a standardized test, perform at a consistently above-average rate on exams, while others refer to teachers for recommendations. There is no one parameter that students need to meet to be able to qualify for GT, but generally, students who perform above grade level or who need more of a challenge beyond the general education standards are those who qualify for GT services (Peters et al., 2020). Peters et al. (2020) also state that traditional forms of GT services that focus on core subjects students excel at are slowly transitioning into an inclusive program that supports the talent development of all students, not just those who qualify based on a standardized test.
Additionally, 2E students qualify for GT but are also diagnosed with a disability defined by the Individuals with Disabilities Education Act. These students do not have a cognitive disability, though. Identification of 2E students takes thoughtful consideration and assessment by teachers, and ultimately a student’s individualized educational plan must include talent development goals if they are going to participate in a GT program (Reis, 2014).

**Benefits of inclusion of GT and twice exceptional.** Borovay et al. (2019) report that gifted students who engage in frequent IBL are more motivated to participate in class than students who participate in occasional inquiry. High-achieving students enjoy inquiry because the IBL is more challenging and active than traditional teaching practices like lecture-based instruction. One benefit of IBL is that it is flexible. Students can work independently or with classmates. Typically, gifted students prefer working independently than with partners (Barone & Barone, 2019). IBL and inclusive classrooms invite students to work with classmates who learn and think differently from one another, but also gives students choice in how they learn and who they want to learn with. These diverse and open-ended experiences provide all students the opportunity to develop skills such as tolerance for working with different individuals, problem-solving skills (Divrik et al., 2020), and to meet grade-level standards at a faster rate than in a traditional pull-out model (Jackson et al, 2008). Traditionally, GT programs use a pull-out model. Students who qualify for GT meet with a GT teacher for part of their school day to work on accelerated math and reading.
Preckel et al. (2010) wanted to know the effects of ability grouping for gifted students on their academic self-concept and boredom. Boredom is used to justify a pull-out model for gifted students, but with that model comes negative effects on academic self-concept.

The participants in this study were 186 ninth-grade students who were split into eight classes, four classes for gifted students and four classes for mainstream classes. Students in the gifted class were selected by parent nominations, IQ score, grades, and teacher evaluations. Students in the gifted class showed significantly higher IQ scores than students in the mainstream class and overall higher grades. Both groups of classes had similar gender compositions. Data were collected through self-report questionnaires and once by a standardized IQ test in four waves during the end of students’ eight grade year and the first half of their ninth-grade school year: once at the beginning of the year, ten weeks later, and then fifteen weeks later. The questionnaire consisted of six items to measure the frequency of boredom such as ‘I am often board in mathematics classes’ and the responses ranged from 1, strongly disagree, to 5, strongly agree. Additionally, the questionnaire consisted of four items to measure the reasons for boredom such as ‘When I am bored in mathematics classes, this is because the subject matter is too easy/difficult for me’ and followed the same range as the frequency of boredom survey.

The results of the questionnaire indicate that students, who evaluated their math ability to be high, experienced less boredom in class. Preckel et al. (2010) explained that boredom occurred when students were under-challenged. In addition, frequency of
boredom was also due to being over-challenged because students were less motivated to put forth effort when the content was too rigorous for them.

For academic self-concept, students who began in a mainstream classroom and moved to a gifted classroom decreased in self-concept over the evaluation period more than the gifted students who stayed in the mainstream setting. Students in the mainstream class and not part of the gifted group showed no change in self-concept over the evaluation period. Keeping gifted students in a mainstream setting, or only having gifted students for the entirety of the school day, is shown to maintain the beliefs about oneself. Keeping gifted students in the mainstream classroom and engaged in appropriate and rigorous work is important for their self-concept and attitude about school (Preckel et al., 2010).

Effects of Inquiry-Based Learning for Mixed-Ability Classrooms

The goal of IBL is to create learning opportunities that are rich, purposeful, and dynamic, while challenging students to think critically and creatively about their learning (Coffman, 2017). Using IBL is an effective way to differentiate instruction, meet the needs of all students, and teach them how to persist, manage, listen, and think flexibly. Students gather and analyze data during the inquiry process, ask new questions, and communicate their learning, a skill set meant to develop lifelong learning habits. Through IBL, instruction and delivery of content are modified to meet the needs of all learners, which leads to higher student engagement. While some students find IBL to be a natural fit, others need more support, hence the purpose of guided inquiry. Ultimately, Barone and Barone (2019) found that students’ conversations and inquiry planning became more
sophisticated as they engaged in the inquiry process throughout a school year. Noting this is important as teachers plan for the use and practice of IBL in their classrooms.

Inquiry learning requires students, especially high achieving, to think flexibly and seek challenges (Freedberg et al., 2019) they would not otherwise receive in a traditional classroom. A common feeling among students is a fear of failure. With IBL, classroom routines are established so that students feel confident asking questions, seek other perspectives and help, and develop independence giving teachers more time to provide targeted support to all students. Developing successful problem solving and inquiry gives students choice in content and how they share their information, which creates authentic learning experiences students feel confident participating in (Coffman, 2017).

Freedberg et al. (2019) found that an overwhelming majority of teachers interviewed expressed difficulties providing instruction to high-achieving students while frustrating low-achieving students in a traditional classroom setting. Using IBL to provide individualized learning support reduces teacher frustration and increases their abilities to meet all students’ needs.

**Self-Directed Learning**

Inquiry learning is self-directed. Inquiry does not replace the teacher but creates a space for students to explore new content and challenge current understanding. Divrik et al. (2020) researched the effect of inquiry-based learning on student problem-solving and problem-posing skills in mathematics. The inquiry process used in the study follows these steps: simplification and representation, analyzing and solving, interpretation and evaluation, communicating and reflecting, and reviewing the process.
The study group consisted of three fourth-grade classes with sixty-three students. Students were placed into two experimental groups and one control group: inquiry-based teaching supported by metacognitive strategies, inquiry-based teaching, and problem-solving and problem-posing groups. Grade averages in mathematics were used to determine which class was assigned what, treatment group. The achievement of all three classes was calculated prior to the study and Divirk (2020) found the mathematics achievement of the three classes was equivalent, therefore students did not need to be placed in a different classroom.

The first experimental group, the application of inquiry-based learning supported by metacognitive strategies, met for nine weeks for one hour a day. Various metacognitive strategies were used including guidance cards, worksheets, checklists, error evaluation forms, peer evaluations forms, reflective journal writing, homework guides, and a self-assessment scale to develop students’ metacognitive skills. The second experimental group, inquiry-based learning, only used inquiry steps without applying metacognitive strategies. Both experimental groups completed forty-five problem-solving and problem-posing activities in school and twenty activities at home. The control group completed the same sixty-five activities but did not use inquiry-based strategies to complete the activities. All students completed a pretest and posttest.

According to the posttest results, there was little difference between the results of the second experimental group and the control group with mean ranks of 25.67 and 27.16 in the problem-solving skills portion of the tests. The first experimental group significantly outperformed the other two groups with a mean rank of 30.39. The results
indicate that students benefit most from inquiry-based learning supported by metacognitive strategies. However, when students were evaluated on their problem-posing skills, both experimental groups had similar scores with mean ranks of 26.66 and 24.93. The control group, with no inquiry-based teaching or learning, had a mean rank of 22.42, indicating that inquiry-based learning improves student ability to problem-pose better than pedagogy that does not promote inquiry strategies. In addition, the ability to problem-solve for the first two experimental groups increased slightly from the pretest to the posttest, but the ability to problem-pose increased significantly for the first group from a mean rank of 20.64 to 26.66. Again, students benefited from the metacognitive scaffolds which reinforce that inquiry improves student problem-solving skills and that metacognition is necessary to solve mathematical problems.

Dirvik et al. (2020) provide the following suggestions for teachers implementing inquiry-based learning in their classrooms: encourage students to conduct research and solve problems and prepare a learning environment in which students activate their metacognition skills through questions, research, and analysis. Furthermore, problem-posing skills are just as important as problem-solving skills and should not be considered separate. Problem-posing should be included in the inquiry process and used to facilitate what problems and solved.

Inquiry-based teaching and learning also provide students with choice and individualized learning, a popular topic among teachers today. DeMink-Carthew and Netchoh (2019) wanted to know if students really enjoy making choices in their learning and a personalized learning experience.
Seventy-two students in grades seven and eight participated in the study. In a social studies class, students engaged in inquiry learning about ancient civilizations. The inquiry unit was split into two phases. In phase one, students co-developed inquiry questions about ancient civilizations with the teacher. In phase two, students participated in co-planning, inquiry, presentation preparation, and sharing. In both phases, students were participating in guided inquiry, but were given the freedom to choose how they learned including visual journaling or typed notes, frequency of check-ins with the teacher, working at a desk, table, or floor, and the type of media to explore including videos, websites, or books.

After the two phases, students were asked the following: if they liked choice and experienced low stress, liked choice and experienced high stress, neither liked or disliked choice, disliked choice and experienced high stress, and disliked choice and experienced low stress. Of the 72 participants, 53 reported liking choice and experienced low stress, seven liked choice and experienced high stress, 10 were indifferent, two students disliked choice, and one experienced low stress while the other student experienced high stress. Overall, 74% of students enjoyed a more individualized learning experience.

**Student Self-Efficacy**

When students participate in IBL, they are developing skills needed beyond their primary education years such as how to work in teams, solve complex problems, persist through challenges, and apply knowledge to other contexts. While traditional pedagogical approaches teach specific skills and content, inquiry-based pedagogy teaches both content and life skills. One benefit to IBL is that student critical thinking and self-
efficacy increase or are greater than students who participate in a direct instruction learning model.

Kamal and Suyanta (2021) randomly sampled two classes of eleventh-grade students who participated in direct instruction and IBL models. Students participated in critical thinking ability tests and self-efficacy questionnaires at the end of the study. The critical thinking skills that were assessed include the ability to plan, interpret data, analyze, solve problems, and conclude and evaluate. The self-efficacy skills found in the study include self-confidence, courage, independence, responsibility, and a positive attitude.

Students who participated solely in the IBL class had greater critical thinking skills than the direct instruction group. Kamal and Suyanta (2021) calculated the effect size of both learning models using Partial Eta Squared. The IBL model had an effect of 20.6% on the ability for students to think critically whereas the direct instruction model had an effect of 13.6%. Similar results occurred for the self-efficacy test. The IBL model had 20.6% effect on self-efficacy and the direct instruction model had an effect size of 8.9%. According to the Partial Eta Squared test, any result greater than 6% is considered to have a medium effect and 14% is considered to have a large effect size.

This study proves that students who participate in IBL are more likely to develop life skills like critical thinking, but also have greater self-efficacy, which leads to an increase in students’ ownership of their learning and motivation to persevere in difficult situations. Specifically, this study found that students’ who were in the IBL group had more self-confidence than the direct instruction group by 2.3, optimistic attitude by 1.6,
independence by 0.7, courage by 2.8, responsibility by 0.8, and a positive attitude by 0.2 points. Kamal and Suyanta (2021) conclude that the more active a student is in the learning process, the higher their self-efficacy and critical thinking skills are.

**Higher Order Thinking Skills**

Vidergor (2018), who studied IBL in elementary, and middle and upper grades, found that a multi-dimensional curriculum model supported by inquiry, problem finding, problem-solving, construction, and analysis of concept improved students’ higher-order thinking skills by 40% as compared to the control group who were instructed in a traditional teaching model.

The intervention group included 117 students in grades 4 through 6 and 82 students in grades 9 through 12. In addition, the classes of students in the intervention group were not mixed ability but rather separated based on academic level from below grade level, to at grade level, to above grade level. Even though that is the case, the results still indicate the benefits of inquiry-based instructional models for a diverse variety of learners.

The tools used for the study include a higher-order thinking questionnaire about inquiry, problem finding and solving, and analyzing results. An example from the questionnaire is “Define one selected problem. Start with: In what way can we…”, which addresses the problem-finding skill (Vidergore, 2008, p. 105).

Vidergor (2018) found that in the intervention group, the boys’ mean scores from the pre-test to the post-test increased less than the girls’ mean scores of the intervention group. The boys’ mean score increased from 21.22 to 58.89 whereas the girls’ mean
scores increased from 21.05 to 63.27. These results reveal that girls, most especially, benefit from inquiry-based pedagogy practices applied to different units of study. The control groups’ scores did not significantly increase. The boys’ mean test scores increased from 19.35 to 23.67 and the girls’ mean scores increased from 12.48 to 15.56 after traditional instruction in the same units of study as the intervention group. More significantly were the results from the elementary mean scores to the secondary mean scores. The elementary experimental group increased from a mean score of 19.25 to 60.63 and the secondary experimental group increased from 31.85 to 63.60. The elementary control group increased from a mean score of 15.33 to 19.31 and the secondary group increased from 33.10 to 37.10.

The results of this study prove that while more traditional pedagogy practices do improve student learning outcomes, an inquiry approach still has a more significant impact on student learning. Vidergor (2018) concludes that the study needs to continue to determine the long-term effectiveness of IBL over the course of students’ educational careers.

**Inquiry-Based Learning for Students in Special Education**

Students in special education have a variety of learning, social, and emotional needs that classroom teachers are required to meet based on the legal document, individualized learning plan. While these students are not always able to participate in the general education curriculum without modifications or adaptations, strategies such as IBL assist the teacher in developing authentic, effective learning experiences for students in special education.
The two studies described below demonstrate how inquiry impacts students in special education who are identified as learning disabled (LD), LD with an emotional, speech, or language impairment, and physical or other health impairments. Although these studies represent and assess a diverse group of students who general education teachers often instruct in today’s classrooms, lacking in the studies include students with Down syndrome or Autism. Nonetheless, both studies provide important implications for classroom teachers. While IEP’s support classroom teachers to meet the needs of their students, an additional strategy like IBL is proven to be a successful way to modify, adapt, and include all students in the learning experience.

The first study, conducted by McGrath and Hughes (2018), analyzed 6 middle school students with a LD in a general education science classroom. Due to the abstract nature of science learning, the authors share that science knowledge is best received through active learning versus traditional practices such as textbook reading, lecture, and note-taking. While those practices are still important to implement after students have completed the inquiry part of the lesson, those skills are difficult for students with limited literacy and comprehension skills to develop. Rather, McGrath and Hughes (2018) suggest that rigorous science instruction must include inquiry as a scientific practice.

Supported by the National Science Teaching Association (NSTA, 2014), inquiry requires a range of cognitive, social, and physical skills that prepare students for everyday life outside of the classroom setting. Likewise, many of these skills are required by a student’s IEP, making inquiry an interdisciplinary practice in most classroom settings. Incorporating inquiry skills deepens student understanding of their world while
motivating students to follow science and engineering practices developed by the NSTA such as: asking questions and defining problems, developing and using models, planning and carrying out investigations, analyzing and interpreting data, using mathematics and computational thinking, constructing explanations and designing solutions, engaging in argument from evidence, and evaluating and communicating information (2014).

McGrath and Hughes (2018) wanted to know more specifically how students with LD develop the following skills: asking questions and defining problems, planning and carrying out investigations, and analyzing and interpreting data. Following these three steps is similar to Coffman’s (2017) inquiry approach, where students ask questions, discover answers, present findings, and explore options. The three research questions the authors wanted to discover include: how well students acquired science process knowledge, how did students engage in science curriculum to acquire science process and content knowledge, and what strategies did students and teachers use to facilitate the understanding of science process knowledge.

To be eligible in the study, students were required to be enrolled in a general education middle school science classroom, identified as LD in reading and/or mathematics, and receive services for special education. In the classroom studied, 77% of students returned parent permission forms, therefore 6 middle school students, 3 boys and 3 girls, in special education participated in the study. The educators involved also consented to the study and taught inclusive middle school science. Paraprofessionals were present in the study and supported the classroom teacher in teaching the inquiry process. The study included observations during the science class period, student
interviews, and educator interviews. The observation portion of the study analyzed how well middle school students were acquiring science process knowledge and how well students with LD engage in the inquiry process versus general education students.

McGrath and Hughes (2018) found that students had a difficult time identifying a question related to the inquiry task. However, students’ ability to plan an investigation and follow through with the investigation showed more promise along with analyzing and interpreting the results. Likewise, across all six students, peer support played a role in their learning. All students were very social, which helped and hindered their ability to engage fully in the inquiry process due to distractions. Some students who were engaged socially used their peers for guidance while others disregarded, or their peers disregarded them. The authors found that self-advocacy was a challenge for most of the students in special education when they needed help. It did not appear that the teachers were utilizing the students’ IEPs, which likely impacted their ability to be successful in the mainstream classroom. The educators did not intentionally provide accommodations to students but used other strategies such as visual supports or informal check-ins like thumbs up or down if students understand or do not understand. Paraprofessionals were used to support on-task behavior and provided more accommodations to the students than the classroom teacher did like reteaching the content of the project. Despite some flaws of the inquiry lesson, inquiry did help students acquire some inquiry skills like carrying out an investigation and analyzing results.

Overall, the classroom teachers in the study need to be more prepared to meet the needs of their students in special education because those students can be successful in
the general education classroom with appropriate support. Acquisition of the inquiry process could have been more successful in this study with a guided inquiry model with more scaffolding rather than using an unguided model. Furthermore, students in this study were socially driven, fitting for middle school-aged students, so intentionally establishing working groups could have impacted the acquisition of inquiry skills if the classroom teacher had been more prepared to do so.

Unlike what happened in McGrath and Hughes’ (2018) study where instruction and inquiry were not scaffolded by the classroom teacher, Rapp (2005), found scaffolding helped students with disabilities engage in the social and cognitive nature of inquiry. This study took place in two locations though, the general education setting and at a science museum. Of the participants that returned consent forms, four students in special education and 18 students in general education participated. Participants were observed during four half-day field trips to the museum and four full-day visits in the classroom. In addition, participants completed questionnaires after each museum visit that evaluated their proficiency in the content studied. The purpose of the study was to determine what factors including scaffolded instruction, meaningful and contextualized activities, self-regulated learning, activities responsive to learning styles, rates, and ability levels, learning communities, the social construction of knowledge, parental involvement, and play impacted student learning at the museum. Secondly, the authors also wanted to determine the extent to which the first four factors cognitively impacted students while the second four factors socially impacted students with disabilities.
Rapp (2005) found that all students in the inclusive, third-grade class demonstrated cognitive and social growth, but more specifically, of the four students in special education who participated in the study, two demonstrated more cognitive growth and two demonstrated more social growth. The author attributes this growth to the specific support students received while participating in meaningful inquiry activities. In addition, students self-prioritized their learning and had a greater choice in what they wanted to explore at the museum versus in a traditional classroom environment. This led to more learners feeling empowered to make educational decisions that best fit themselves.

Next, Rapp (2005) observed general education students recognizing the students in special education making contributions to the learning community leading to new social groups being formed despite academic, social, and emotional differences between the students. The inquiry nature of the museum led to many positive experiences for all students involved. Translating a similar inquiry experience in the classroom setting is more challenging due to the limited resources teachers have available to them. Supplementing with field trips and creating other opportunities for inquiry in the classroom is important for all students involved.

**Inquiry-Based Learning for Culturally and Linguistically Diverse Students**

Supporting culturally and linguistically diverse students takes careful planning as inquiry can be a challenging task when English skills are limited. Similar to students in special education, English learners also need appropriate scaffolding and direct support to be successful at inquiry. Yet, the impact of inquiry-based learning can be powerful.
Garza et al. (2018) conducted a study of eight 5th grade classrooms that focused on increasing ELs’ achievement in science and language. The study provides an analysis of teacher pedagogical practices and demonstrates how practices that focus on promoting verbal and written interaction among students increase EL’s science and language achievement.

The authors conducted an observational analysis of pedagogical practices used by treatment and control classrooms. The study took place in a large, urban school district where 46% of students were native Spanish speakers. The treatment classrooms used the Science Enhanced Instructional model, which included biweekly professional development sessions for teachers and monthly training for paraprofessionals. The sessions allowed teachers to become familiar with upcoming lessons and reflect on their inquiry practice. Students in the treatment classrooms learned science by inquiry and received specific language instruction through the use of science notebooks, oral vocabulary building activities, and reading strategies. Control classrooms used typical science instruction strategies per the district’s professional development guidance, meaning some of the control classrooms could have also used inquiry strategies. The control classrooms did not receive biweekly professional development as the treatment classrooms did. Classroom observations took place at the beginning, middle, and end of the academic year in both the control and treatment classrooms. At the end of the study, 1,966 observations on teacher pedagogy in the treatment and control classrooms occurred. Observations on teacher practices included activity structure like lectures, demonstrations, cooperative learning, inquiry, communication mode such as listening,
speaking, reading, and writing, language content including light cognitive language like a repetitive drill, skills practice, or specialized vocabulary, and the language instruction was delivered in.

In the control classrooms, more occurrences of teacher-centered activities were present along with higher occurrences of interruptions. The treatment classrooms had more student-centered activities like cooperative and inquiry learning with higher levels of student participation. Furthermore, students in the treatment classrooms used content-based vocabulary more than the control classrooms. Overall, students in the treatment classrooms provided more opportunities than the control classrooms for writing (24.2% vs. 18.8%), discussions (33.8% vs. 25.8%), and a combination of reading and writing (0.6% vs. 0.0%), and verbal-reading (2.3% vs. 0.2%), leading to more dense cognitive activities (65.7% vs. 21.4%).

Early and Kendrick (2019) wanted to answer the question, what is the potential for inquiry-based approaches for ELs’ language, literacies, and content learning, as mandated in twenty-first century curriculum. They sought expert language and literacy educators who were known to be experts in language and literacy curriculums, had first-hand experience as classroom teachers, and who also taught at the collegiate level in education. Eight educators met this criterion and were participants in the study. The interviews were structured around four areas: background information, values, concepts, and strategies related to IBL and the potential with ELs, insights on guiding principles related to pedagogy practices, school environment, and curriculum, and additional comments.
Early and Kendrick (2019) identified guiding themes that emerged from the interviews. The first theme was using inquiry-based pedagogy to enable ELs to build on their background knowledge. Providing ample access to content knowledge and allowing ELs to represent their understanding through preferred multimodal pathways promotes inclusivity that they may not otherwise have in a non-inquiry-based classroom. In addition, one of the participants mentioned that inquiry enhanced her students’ investment in their learning because learning was fun. Students were demonstrating creative and critical thinking skills, advocated for themselves, and developed social skills from the collaborative nature of inquiry.

The second theme identified was that inquiry-based pedagogies engage ELs in literacy skills. One interviewee noticed her students making learning relevant to themselves and used plurilingualism to communicate their findings. In the discussion with the other educators, another agreed that inquiry allows students to express themselves academically, socially, and emotionally. Students bring funds of knowledge to the general classroom setting and facilitate intercultural awareness along with respect for students who speak more than one language. The expert educators agree that inquiry gives all students the opportunity to share their voice and addresses marginalized groups who typically are not represented in traditional curriculums and classroom settings.

The last theme of the study stresses the importance of using digital tools for inquiry. One expert teacher used inquiry to teach students how to use digital tools for productive purposes. She taught her students how to use dual-language texts along with common programs like PowerPoint or Google translate. The tools reinforced the notion
that all students can fully participate in the inquiry classroom just as theme two emphasized, but that with the use of digital tools comes a responsibility to teach students how to research effectively and safely. One educator shared that the benefits of using digital tools to enhance the inquiry experiences outweigh the negatives and that technology bridges the gap between linguistic differences. Overall, inquiry pedagogy deepens students' understanding and investment in their learning. From literacy and social skills students developed in the experimental classroom of Garza’s et al. (2018) study to expert educators’ perspectives in Early and Kendrick’s (2019) interviews, IBL enhances the learning experience of all students and creates an environment that supports diverse learners.

**Inquiry-Based Learning for Gifted and Talented and Twice-Exceptional Learners**

Gifted and Talented and Twice Exceptional Learners traditionally are placed in a separate setting during the times that they qualify for pull-out instruction. Rather than following a traditional model, inclusive classrooms either allow for specialist teachers to push in, or the classroom teacher facilitates learning that meets the needs of these types of learners using strategies like IBL. Redding and Grissom (2021) found a small benefit to a traditional gifted program. They share that a traditional model may improve school outcomes because of access to highly engaging teachers and curriculum.

Meanwhile, Callahan et al. (2015) studied exceptional students in both push-in and pull-out models and found that students in both models benefited from inquiry mixed with content-based instruction and learning activities. Although there are benefits to a traditional model pull-out model, IBL can still be used to challenge and engage gifted
students while staying within the general education setting. In addition, to Callahan et al.’s (2015) study Ülger and Çepni (2021) also found that inquiry increases student outcomes in gifted students’ science process skills. Nonetheless, inquiry-based learning is a powerful tool classroom or specialist teachers can use to challenge the thinking of their exceptional learners.

Ülger and Çepni (2021) reviewed the impact of inquiry instruction for gifted students through the use of a pre-test and post-test and observations. A total of sixteen gifted students, seven girls, and nine boys, from six different fifth and sixth grade classrooms, participated in the study. The instructor for the inquiry course had fifteen years of experience and implemented inquiry practices in his classroom. Students participated in three modules where they followed the steps of a scientific inquiry process: hypothesis building, using data, experimentation, decision-making, and changing and controlling variables. Although the scientific inquiry process is slightly different than a research-based inquiry process, students are still planning, adapting, and reporting their learning. Since the content of all modules was selected by the teacher, students did not get the opportunity to choose what they wanted to study. Rather, the first module was a forensic and crime scene investigation. The second module was a look into an athlete’s race preparation and training such as Usain Bolt’s records and races. The last module was about plastic pollution in the sea and the structure of plastic. Module one and two lasted four weeks while module three lasted three weeks.

Ülger and Çepni (2021) found very significant differences between the pre-test and post-test results. The effect size was 1.35, and anything over 0.8 is considered to
have a high effect. Due to this result, the authors conclude that inquiry classes for gifted students have a significant effect on the development of students’ scientific process skills. The authors also conclude that partnering challenging activities with inquiry is essential to developing the scientific process skills for gifted students.

Callahan et al. (2015) randomly assigned pull-out or self-contained third-grade classrooms to treatment and comparison conditions. The study lasted three years with 1,215 students from 71 pull-out classrooms and 14 self-contained classrooms in 11 states participating the first year, 1,007 students from 66 pull-out and 16 self-contained classrooms in 14 states participating the second year, and 683 students from 51 pull-out and 5 self-contained classrooms in 19 states participating in year three of the study.

Teachers in the treatment condition were given two literacy units to implement, one focused on poetry and one focused on non-fiction inquiry. In addition, teachers were provided all the necessary instructional materials including a presentation of rationale for the units, explanation of how the units were developed, instructions for implementation, and student materials. Furthermore, when teachers had questions or needed support, the research team provided assistance via phone calls, emails, and an online resource center. In order to maintain the fidelity of the treatment program, the research team also used classroom observations and teacher interviews to monitor implementation. While the treatment program was implemented, comparison classrooms did not change their instructional practices and continued with unit plans as written. The research team also conducted interviews and observations with comparison classrooms. Both students in treatment and comparison classrooms took a standardized reading pre-test since both
units focused on literacy skills. The learning outcomes for both units required students to analyze, synthesize, and form conclusions that traditional assessments are limited in measuring. Therefore, two standard-referenced posttests were developed in addition to the standardized reading test to assess the effectiveness of the treatment program. For the first two cohorts, the treatment groups’ outcomes were statistically significant for both pull-out and self-contained classroom models. The third cohort only focused on the poetry unit and not inquiry, making the data irrelevant to the purpose of this paper.

The mean score on the standardized reading test in the first module for the treatment group was 201.17 and the mean score for the comparison group was 195.02. With that said, module two had opposite results with the mean score of the comparison group being higher than the treatment group. However, when students took the standard-referenced posttests, the treatment group in module two outperformed the comparison group.

Callahan et al. (2015) conclude that teachers of high achieving and high potential students need to use rich curriculum and responsive instructional practices to meet the needs of these learners and recommend that more research is completed to truly determine the impact of gifted education. Similar to Ülger and Çepni’s (2021) study that reinforces gifted students need a rigorous curriculum that uses challenging activities with inquiry, Callahan et al. (2015) and Redding and Grissom (2021) also agree that highly engaging teachers and curriculums promote the academic success of gifted students. Classroom teachers can successfully use IBL to push gifted students to reach their fullest
potential, while continuing to meet the needs of a variety of learners in the mainstream classroom.
CHAPTER III: DISCUSSION AND SUMMARY

Summary of Literature

The goal of this literature review was to find evidence that all students can be active members of the mainstream classroom through the use of inquiry-based learning and inclusive classroom strategies. Additionally, the review expanded the benefits of inquiry and inclusion for specific populations of students. Although proven that all students benefit from an inclusive learning environment and experience a greater investment in learning when they are committed members of the learning community (Dack & Tomlinson, 2014), extended research is needed to determine the impact inquiry and inclusion have on individuals through adulthood. To truly understand how this type of learning environment benefits students as they pursue careers and additional educational opportunities, more research must continue to be conducted for specific populations of students.

First, the review began by naming what inquiry-based learning is. While IBL strategies can vary, all inquiry follows a very similar structure: asking questions, discovering answers, presenting findings, and exploring options (Ashman et al., 2020; Coffman, 2017; Divrik et al., 2020; Hushman & Marley, 2015; Lazonder & Harmsen, 2016; Rosengrant et al., 2021). Guided inquiry is an effective way to teach students the inquiry structure while allowing them safely take risks, develop problem-solving skills, and collaborate with peers (Lazonder & Harmsen, 2016). Additionally, guided inquiry increases student self-efficacy, improves students’ ability to answer recall questions about their learning (Hushman & Marley, 2015), and encourages on-task behaviors...
(Hushman & Marley, 2015; Rosengrant et al., 2021). Ashman et al. (2020) found that guided inquiry is also beneficial to students while they work on highly specific work like learning a new mathematical procedure. Similar to guided inquiry, Song (2018) found that unguided inquiry raises student's voice and allows them to explore a topic of interest that they might not otherwise have the opportunity to learn about. Choice is necessary for autonomy in school and honoring individuality (DeMink-Carthew & Netchoh, 2019), whereas a safe learning environment for students to take risks is crucial to developing their problem-solving skills for a future beyond the classroom setting (Song, 2018). Both guided and unguided inquiry have a place in classroom pedagogy. Depending on the development and academic needs of students, teachers can engage students in a form of inquiry that best suits their learners.

Next, the review explored the benefits of inclusion such as increased independence and problem-solving skills, and overall school engagement. Jackson et al. (2008) argue that when students of different abilities collaborate and solve problems together, a stronger community is formed which creates a safe space for all students to learn. Furthermore, teachers who use different grouping strategies such as homogeneous, heterogeneous, or interest naturally facilitate the collaboration of different student groups who might not naturally collaborate. Since students in special education who spend a majority of their day in the mainstream classroom perform better academically and socially (Cole et al., 2021, Kart & Kart, 2020; Krämer et al., 2020), grouping strategies allow interventionists and special education teachers to provide services in an inclusive setting rather than removing students from the mainstream classroom. Likewise,
culturally and linguistically diverse students also benefit from inclusion and collaboration with their peers. Qianqian (2017) found that student-centered pedagogy, like IBL, promotes choice and creates space for students who are traditionally fearful of taking risks to feel safe enough to work with students who do not speak their native language. Pairing students of different cultures, languages, and abilities creates an environment where all students are successful, independent, and welcoming learners (Jackson et al., 2008; Suto, 2020). Both Whiteside et al. (2017) and Yun et al. (2018), found that ELs can have strong social regulation skills and academic buoyancy despite social and learning barriers. Those skills allow ELs to be leaders in their classrooms when other students may feel more limited in their potential during new learning experiences. Without the inclusion of culturally and linguistically diverse students, mainstream students and students in special education miss the opportunity to develop cultural awareness, tolerance, and communication strategies. Just as students in special education and CLD students benefit from an inclusive learning environment, students in gifted and talented programs also need mainstream classroom experience. Barone and Barone (2019) report that GT learners usually prefer working alone, but Divrik et al. (2020) argue that it is just as important for these students to learn to work with individuals with different abilities as it is for them to work with students of similar abilities. While Redding and Grissom (2021) found a small benefit to a traditional pull-out model for GT students, Jackson et al. (2008) found that students met grade-level standards more quickly when placed in an inclusive environment rather than in a traditional pull-out model. Typically, GT students already meet grade-level standards, but Preckel et al. (2010) discovered that when pulled
out of the mainstream classroom, GT students' academic self-concept decreases. Preckel et al. (2010) continue to support an inclusive GT program as inclusion teaches tolerance, and communication, and problem-solving skills (Divrik et al., 2020).

After that, the review discussed the impact of IBL on mixed-ability classrooms. As students become familiar with the inquiry process, teachers may begin using an unguided inquiry model while more specifically supporting individual and small groups of students. As students use inquiry and become more familiar with the process, students’ ability to collaborate and support each other may also become more detailed and sophisticated (Barone & Barone, 2019). Furthermore, supporting all students in mixed ability classrooms can be overwhelming and challenging for teachers (Freedberg et al., 2019), but once students achieve autonomy, ownership, understand how to implement the inquiry process, and problem-define (DeMink-Carthew & Netchoh, 2019; Divirk et al., 2020; Song, 2018; Vidergor, 2018, Whiteside et al., 2017; Yun et al., 2018), teachers have more time to meet more specific needs and create authentic learning experiences (Coffman, 2017). DeMink-Carthew and Netchoh (2019) found that students enjoy choice and individualized learning experiences; whereas Kamal and Suyanta (2021) determined that the more active students are in the learning experience, the greater self-efficacy and critical thinking skills are. Vidergor (2018) also found that higher-order thinking skills increased when students were engaged in inquiry. More specifically, students with learning disabilities were able to develop the necessary inquiry skills of planning and carrying out an investigation through the use of this learning model (McGrath & Hughes, 2018), and Rapp (2005) found that cognitive and social growth occurred in their students
with LD when engaged in inquiry. Another benefit of IBL is that culturally and linguistically diverse learners are more engaged and willing to use content-based vocabulary when participating in hands-on, active learning experiences, in addition to demonstrating prosocial behaviors such as participating in discussion and asking for help (Early & Kendrick, 2019; Garza et al., 2018). Similar to students in special education and culturally and linguistically diverse students, students identified as gifted and talented also have similar benefits to using inquiry. Callahan et al. (2015) studied students in both a push-in and pull-out GT model. Students in GT who participated in IBL increased their science process skills (Callahan et al., 2015; Ülger & Çepni, 2021).

Overall, inclusive and inquiry classrooms benefit all types of learners. Ultimately, educators must consider the mode in which students are going to learn and demonstrate content mastery. Instructional strategies should be selected based on the desired learning outcome (Hushman & Marley, 2020), and inquiry proves to be a very effective way to meet all students’ needs while teaching students academic adaptably (Freedberg et al., 2019), planning, processing, and problem-solving skills (Barone & Barone, 2019; Divrik et al., 2020; Vidergor, 2018), in addition to increasing confidence and belief in oneself (Coffman, 2017; Kamal & Suyanta, 2021).

**Limitations of the Research**

This literature review focused on evidence-based research focused on inquiry or active learning and inclusive education. The research was primarily selected from 2016-2021, with some research from as early as 2005, through searches of ERIC, Academic Search Premier, EBSCO MegaFILE, and PsycINFO.
During the research phase, I realized that current research in the United States focused primarily on inclusive strategies for students in special education and gifted students, whereas international research focused on a greater variety of student groups. Additionally, I found limited research focused on elementary aged students for inclusive and inquiry classrooms, which is why I also included international research. Inquiry learning is becoming a popular practice beyond the science classroom, but limited research has been conducted for elementary students in regard to research-based inquiry. To overcome these barriers, I expanded the age group and location of students researched in this literature review to find appropriate information to answer my research questions. I also wanted to learn how educators in other countries are responding to inquiry-based and inclusive classrooms since schooling and educational policy in the United States is different than in other countries.

**Implications for Future Research**

Despite the challenges of finding relevant research grounded in inquiry and inclusive classrooms, I managed to find information that answers my research questions. More studies and research that extends years beyond student’s primary education years need to be conducted to truly understand the impact of inclusive classrooms. Furthermore, more schools need to implement an inclusive school model so that research can be conducted. Many articles have been published about teacher perception of inclusive classrooms, but few have been published about the impact on students and their perceptions of inclusive education.
In addition to continuing the research of inclusive education for all types of learners, inquiry, specifically research based inquiry must also continue to be studied. Historically, inquiry has been associated with science-based learning, but now that 21st Century Skills are the foundation to students’ success beyond the classroom, research-based inquiry and the skills students gain practicing inquiry must continue to be studied.

With that said, here are my recommendations for research moving forward. Continue studying inclusive classrooms and students who are part of such programs. Follow students through their educational career beginning in elementary school through high school to determine how inclusion and inquiry have impacted their social, emotional, and academic growth. Study the impact of inclusion for students in special education in regard to academic achievement and social-emotional health, and lastly, research most effective practices, like inquiry, for inclusive classrooms across a wide variety of locations.

**Implications for Professional Application**

As I learned about the positive impact inclusive education has on all students, the more I considered how I can be an advocate for inclusive education. Inclusion increases academic performance and social-emotional skills for all students (Cole et al., 2021; Jackson et al., 2008; Kart & Kart, 2020; Krämer et al., 2020; Suto, 2020; Whiteside et al., 2017; Yun et al. 2018), yet traditional methods of removing students from the mainstream classroom are still being used today to provide intervention, special education, English, and gifted and talented services. Increasing our awareness of where
students receive their instruction will help all educational stakeholders provide adequate support and create a policy that supports the learning of every student (CPE, 2020).

I plan to continue collaborating with the special education teachers who work with my students to increase the amount of time my students are in the mainstream classroom versus the special education classroom. In addition, I will continue planning with my student’s reading intervention teachers to ensure that they are working on content relevant to our classroom instruction. Creating an inclusive environment takes time and careful planning but increasing students’ mainstream classroom experience ensures academic achievement and social-emotional success.

With inclusive education, I must think creatively to implement inquiry-based instruction in daily lessons. Inquiry instruction teaches students independence, gives them choice, and promotes a problem posing and solving environment (Barone & Barone, 2019; Divrik et al., 2020; Vidergor, 2018). Not all curriculums are structured to use inquiry for daily lessons. but they can be used as a basis for instruction so that curriculum content is still taught through an innovative, student-centered approach (DeMink-Carthew & Netchoh, 2019).

I use a variety of inquiry strategies because they can be implemented in a wide variety of subject areas. For example, in math, when I pose a problem or question, students collaborate with their peers, use their student reference book, and apply their background knowledge to solve the problem. Although this does not necessarily follow a traditional research-based inquiry approach, students are still using similar skills such as communication and collaboration (Early & Kendrick, 2019; Garza et al., 2018), planning
(Barone & Barone, 2019; Divrik et al., 2020; Vidergor, 2018), and trial and error (Qianqian, 2017) that they would engage in traditional research-inquiry. Furthermore, I plan to implement research-based inquiry into my non-fiction literacy units. I will use direct inquiry instruction to teach literacy and inquiry skills while using small groups and independent support to meet students’ learning needs. Students will learn how to use inquiry to research a topic of their choice and share their learning through synthesis and summary writing.

**Conclusion**

More opportunity for inquiry-based learning is needed in our classrooms. With students’ diverse learning needs, inquiry can be used to facilitate social and academic learning while creating an inclusive environment that fosters creative, resilient, and confident individuals (Ashman et al., 2020; Barone & Barone, 2019; Coffman, 2017; Early & Kendrick, 2019; Freedberg et al., 2019; Garza et al., 2018; Kamal & Suyanta, 2021; Kart & Kart, 2021). Inquiry creates inclusion, when intentionally used to personalize learning and teaches important life skills like collaborating with individuals who think or act differently, problem posing and problem-solving skills, and self-efficacy (Bae Francisco et al., 2020; Borovay et al., 2019; Callahan et al., 2015; Cole et al., 2021; DeMink-Carthew & Netchoh, 2019; Divirk et al., 2020; Song, 2018; Vidergor, 2018, Whiteside et al., 2017; Yun et al., 2018). Ultimately, our duty as educators is to inspire engaged, open minded individuals, and to place our students’ learning needs before our own.
References


https://education.mn.gov/mde/dse/el/


https://ngss.nsta.org/practicesfull.aspx


