3-2021

Evaluation of the Implementation of Understanding by Design Processes in Select Minnesota Public Schools

Sangeeta Pradhan Joshi

Evaluation of the Implementation of Understanding by Design Processes in Select

Minnesota Public Schools

by

Sangeeta Pradhan Joshi

A Dissertation

Submitted to the Graduate Faculty of

St. Cloud State University

in Partial Fulfillment of the Requirements

For the Degree of

Doctor of Education

in Educational Administration and Leadership

March, 2021

Dissertation Committee:
James Johnson, Chairperson
John Eller
Frances Kayona
Amy Christensen

Abstract

An effective educational process demands a strong curriculum framework, quality instruction and appropriate assessment for successful teaching and learning and holistic development of students (Tomlinson et al., 2003). A quality curriculum is designed around the core concepts of a subject focusing on in-depth understanding of the key concepts and providing students abundant opportunities to transfer their understanding in various contexts (National Research Council, 2002). Understanding by Design (UbD) is a backward design curriculum framework that supports teachers and curriculum leaders in designing curriculum, instruction, and assessment with the aim of enhancing students' understanding and performance (Wiggins & McTighe, 2005). The general process in planning a curriculum backward using the UbD framework involves three stages that are interrelated and aligned with the state and district standards (McTighe & Wiggins, 2012a). Although UbD assists teachers in unpacking and transforming content standards into meaningful elements and creating a powerful curriculum that ensures academic success of learners, limited information is available whether teachers have been effectively implementing the UbD framework for designing curriculum, assessment, and instruction.

The study aimed to examine teachers' planning of curriculum, instruction, and assessment using the essential elements and the three stages of Understanding by Design in the select school districts in central Minnesota. The study also intended to investigate to what extent the key principles and the essential elements of UbD were practiced for enduring understanding among elementary students in K-12 public school districts in central Minnesota. A quantitative study was carried out to examine teachers' practices in the process of curriculum designing and planning and their understanding and expertise to exercise all the principles set by Understanding by Design. The data was evaluated using Wiggins and McTighe's (2005) the Understanding by Design framework for designing curriculum backward. The curriculum directors from the ten school districts in central Minnesota were the participants for this study.

The findings provided evidence that almost all the curriculum directors' school districts had employed the UbD curriculum framework in planning curriculum, assessment, and instruction. However, only a few core elements of UbD had been implemented while the literature suggests that all the elements are fundamental in designing a quality curriculum and should be focused and applied equally. The findings of the study indicated that the components and the three stages of Understanding by Design curriculum framework were unevenly executed and there was inconsistency in its implementation in the select central Minnesota school districts.

Acknowledgements

I would like to extend my deepest and sincere gratitude to my dissertation chairperson Dr. Jim Johnson. Without his unwavering support and guidance, the completion of my dissertation would never have been possible. It was his depth of knowledge, invaluable suggestions, and endless guidance that helped me persevere and complete my paper. I revere the optimism, patience, and inspiration he displayed throughout this journey that enabled me to handle the turbulences I experienced every now and then.

I would also like to acknowledge my deepest appreciation to my committee members Dr. John Eller, Dr. Frances Kayona, and Dr. Amy Christensen. Their decision to eliminate a section made it easier for me to focus on the specific issue more profoundly. I cannot show enough gratitude for their insightful comments, intellectual suggestions, and positive feedback.

My dream of attaining a doctoral degree would never have been realized without the unconditional love, support, and encouragement of my family. I extremely owe my husband Bijendra Pradhan for making my dream his own and taking care of our kids and our home while I was away. It was his trust, comfort, and constant encouragement that helped me effectuate my degree. Words are not enough to express how grateful I am as a mom whose kids never whined about my absence and my recurrent disconnection with them. My kids Paribhasha and Parishrut have been my little cheerleaders whose ever-smiling bright faces kept my sanity intact in all these years of difficulties.

My appreciations also go to all the individuals who supported me in this endeavor directly and indirectly.

Table of Contents

List of Tables

List of Figure

Figure   Page

Chapter 1: Introduction

Over the years, the purpose of education has shifted. Great emphasis has been placed on curriculum development, instruction, and assessment as essential factors to promote student learning. The educational reform efforts of the early 20th century prioritized adjusting curricula as well as enhancing literacy instruction that ensures effective teaching and learning (Tomlinson et al., 2003). Both the No Child Left Behind Act of 2002 (NCLB) and Every Student Succeeds Act of 2015 (ESSA) imply that teachers are required to have skills and knowledge to plan curriculum and create instructional and assessment practices that emphasizes the holistic development of individuals. The National Research Council in its 2002 report stated that a curriculum should be designed around the core concepts of a subject focusing on in-depth understanding of the key concepts and providing students abundant opportunities to transfer their understanding in various contexts. In this process of designing, the report elaborated, the key concepts should be clarified and organized coherently around the big ideas. When a core concept, theme or idea is meaningful, can be connected to discrete facts and skills and serves as a basis for transfer, then such concept or idea is a big idea (Wiggins & McTighe, 2005). Identifying big ideas and developing essential questions to explore these ideas is important as it equips learners to understand the core subject and transfer their learning. The curriculum framework Understanding by Design (UbD), also known as backward design, which Grant Wiggins and Jay McTighe introduced in 1998 focuses on teachers' planning to meet these requirements. Since student learning and understanding is the primary goal of UbD, the framework assists in designing curriculum, instruction, and assessment that emphasizes learners' deeper understanding of the key concepts (Wiggins & McTighe, 2005). The UbD model ascertains teachers clarify the learning goals to be achieved, plan instruction and assessment

around these goals, and ensures students' learning through enduring understanding. Because "Curriculum for understanding represents more than a collection of activities or bits of information: it provides for the holistic performance of meaningful, complex tasks in increasingly challenging environments" (Resnik & Klopfer, 1989 as cited in the National Research Council, 2002, p. 136). Wiggins and McTighe (2005) recommended educators to align curriculum, instruction, and assessment as the key components of Understanding by Design in the planning process to improve student learning experiences because without the alignment, developing deep conceptual understanding is unrealizable.

Based on the views of recognizing and organizing big ideas rather than focusing on superficial content coverage and engaging students in irrelevant activities, Wiggins and McTighe (2005) agreed that UbD demands teachers develop a learner centered approach to classroom teaching and prepare students with 21st century skills. What teachers teach (curriculum) has a strong influence on how they teach (instruction) (Sousa & Tomlinson, 2011); therefore, a high-quality curriculum should be integrated and structured in such a way that supports teachers and learners to dig deep into the conceptual understanding of a skill and a topic, allows them to use different approaches and strategies to gain essential skills and facilitate them to solve complex problems, and enables learners to acquire knowledge and skills that can be applied to real-life contexts (Glatthorn, Carr, & Harris, 2001). Unquestionably, a high-quality curriculum is developed with the focus on facilitating learners in order to improve learning and to ensure student success. When planning a curriculum, educators need to focus on the in-depth knowledge, understanding, and essential skills students need to acquire and if they do so, it is more likely students will achieve their desired goals (Tomlinson et al., 2008).

Statement of the Problem

Understanding by Design (UbD), a curriculum design approach, is implemented to improve key areas of education in many school districts throughout the United States (McTighe & Seif, 2003). For many school districts, the UbD curriculum framework has become fundamental in curriculum, instruction, and assessment planning that prioritizes learners' in-depth understanding of core concepts and that underlines a practice that facilitates students to achieve a level of mastery and apply their knowledge and skills in unfamiliar and complex situations. On account of this, teachers are expected to plan curriculum, instruction, and assessment that focus on improving learning experiences and teach for understanding for effective learning outcomes (Childre, Sands, & Pope, 2009).

However, research shows that teachers face challenges when designing successful curriculum, constructing effective teaching strategies, creating well-structured learning activities, and embedding meaningful content (DelliCarpini, 2006; Dixon et al., 2014). In 2004, Brown discussed the challenges the teacher participants revealed in implementing and practicing UbD. Pinar and Irwin in their 2005 article on curriculum discourse stated that there is little information available on the deep impact of backward design of curriculum. In the same year, Cho and Trent (2005) argued that designing curriculum that engages students effectively has been more difficult than anticipated because "the major curricular and instructional concerns of this 'backward' discourse emphasize the teacher's effectiveness as measured by student success on formulated assessments more than the teacher's ability to connect knowledge and skills to various student interests and needs" (p. 117). George (2005) had a similar perspective on this issue that only a few teachers have such determination, engagement, and support to make significant changes happen by implementing the Ubd framework in the process of designing and planning

curriculum. Tomlinson and McTighe (2006) agreed that UbD is a complex planning process that challenges teachers, demands them to move out of their educational comfort zone and requires them to be prepared to confront the learning-curve.

Although Wiggins and McTighe (2005) argued that UbD framework is supportive in order to create a powerful curriculum that ensures academic success of learners, limited information is found whether teachers have been effectively designing curriculum and planning instruction using the UbD framework in helping students obtain in-depth understanding. Moreover, Understanding by Design lacks empirical evidence that supports its proper implementation, the role teachers and curriculum leaders play in the process of organizing the principles set by the UbD framework, and reforming curriculum in order to improve learning outcomes in K-12 school settings. This study explored K-12 public school districts teachers' planning of curriculum and instruction and their classroom practices using the key principles and the essential components of Understanding by Design.

Purpose of the Study

The purpose of the study was to examine teachers' planning of curriculum, instruction, and assessment using the essential elements and the three stages of Understanding by Design in the select school districts in central Minnesota. The researcher also intended to investigate to what extent the key principles and the essential elements of UbD were practiced for enduring understanding among elementary students in K-12 public school districts in central Minnesota. The findings of the study will benefit the educators by providing further understanding of the Understanding by Design framework and assist them in identifying the fundamental principles and the essential components of UbD to improve curriculum planning, instruction, and assessment.

Conceptual Framework

Understanding by Design is built upon two underlying concepts: designing curriculum backward and teaching for understanding. Teachers with an understanding of curriculum and knowledge of classroom instruction unpack the content standards, establish learning goals, design instruction that stimulate diverse students' knowledge and skills growth, and develop assessments that provide evidence of students' in-depth understanding.

The conceptual framework of this study is based on Wiggins and McTighe's Understanding by Design framework and its essential elements that lead to successful teaching and learning in elementary classrooms as guaranteed by the architects of UbD. The Understanding by Design framework guides teachers to follow its principles which are the three stages of backward curriculum design; identify the desired learning goals in Stage 1, devise valid assessment as evidence of effective learning in Stage 2, and plan appropriate instruction and learning activities in Stage 3. Based on the literature of these designers, for effective classroom instruction, teachers are required to unpack and translate the content standards into a teachable curriculum and construct appropriate instruction and assessment and adopt several other elements of UbD that focus on the essential knowledge, understanding, and skills (Wiggins & McTighe, 2005). These include:

- Unpack the goals and identify the big ideas

- Develop essential questions to guide inquiry into big ideas

- Frame the big ideas as specific understanding

- Identify key knowledge and skills

- Consider evidence of the understanding, knowledge, and skills identified in Stage 1

- Use the 6 facets to identify needed evidence of understanding

- Use the essential elements to design authentic performance tasks

- Identify appropriate criteria and use them to develop the scoring rubrics

- Gather other informal evidence to test understanding

- Consider what needs to be uncovered

- Use WHERETO in instructional planning

- Use diagnostic and formative assessments to monitor and adjust

Research Questions

The following are the research questions that guided this study:

1. What elements of the backward design process do curriculum directors in select Minnesota school districts report practicing for enduring understanding among elementary students in their schools?

2. To what extent do curriculum directors report that curriculum related elements are employed in the elementary classrooms in select Minnesota school districts?

3. To what extent are stages one, two, and three of Understanding by Design used in the elementary classrooms as reported by the curriculum directors in select Minnesota school districts?

Significance of the Study

The findings of this study may help K-12 public school teachers and curriculum leaders in implementing Understanding by Design as a backward model of curriculum planning in elementary classrooms to stimulate students' understanding and performance over the longer term. Brown (2004) asserted that the primary goal of UbD is to ensure students' understanding and knowledge which they can apply autonomously in real-life situations. "Understanding by Design provides a common language for educators who are interested in promoting student

understanding rather than formulaic knowledge or recall learning" (p. 12). To strengthen students' understanding of the big ideas and exploring the answers and applying them in the real world, it is required that teachers identify the learning goals, analyze assessment data, and develop action plans for enhancing student learning (McTighe & Thomas, 2003).

The research study identified the strategies and the practices of UbD in enhancing students' understandings, and academic and social skills. The study was undertaken to fill the research gaps and to ascertain the implementation of UbD as teachers' responsibility so that they could use it in a proper and effective way to enhance students' achievement.

Delimitation of the Study

Delimitations are the characteristics that limit the scope and the boundaries that a researcher outlines for his/her research study (Simon, 2011). The following are delimitations of the study:

1. The study was limited to select public school districts in central Minnesota.

2. The study was limited itself to surveying the curriculum directors as the key respondents.

3. The focus of the study was limited to exploring the practices of Understanding by Design and its essential elements in elementary classrooms.

4. The study used purposive sampling that reduces the generalizability of findings; hence the study is not generalizable to all areas of UbD implementation.

Assumptions of the Study

1. The participants in this study answered all the survey questions in an honest and truthful manner.

2. The responses received from the participants exactly reflected their practices in the classrooms.

3. The use of the research instrument was accurate in reflecting participants' understanding and practices of UbD in curriculum designing and planning.

Definition of the Terms

The following are the definition of the terms used throughout the paper.

Content Knowledge: Is a knowledge and information of a particular subject that teachers teach, and students are expected to learn (The Glossary of Education Reform, 2016).

Enduring understanding: "Enduring understandings are statements that clearly articulate big ideas that have lasting value beyond the classrooms and that students can revisit throughout their lives" (Brown, 2004, p. 17).

High-quality Curriculum: Helps increase students' deep understanding of the content, allows them to think critically, and retain, apply, and transfer their learning (Sousa & Tomlinson, 2011).

Inquiry-based Learning: Is an instructional approach to learning that helps students develop abilities to make decisions and solve problems (Friedel et al., 2008).

One-time Workshops: "The traditional episodic and fragmented approach to professional development that does not afford the time necessary for learning that is rigorous and cumulative" (Darling-Hammond et al., 2017, p. 15).

Performance-based Learning: Is an approach to teaching and learning that focuses on meaningful and engaging tasks that students perform through the knowledge, skills, and work habits they acquire (Hibbard et al., 1996).

Unpacking Content Standards: Is a process in which the common goal of teachers is to analyze and interpret the meaning of the standards and transform them into effective instructional strategies (Wiggins & McTighe, 2012).

Organization of the Study

The study is organized into five chapters. Chapter 1 presents the introduction of the study, the problem statement, the conceptual framework, the research questions, the significance, and the delimitation of the study. Chapter 2 presents a review of relevant literature on backward design curriculum with a special focus on Understanding by Design curriculum framework. Chapter 3 outlines the research design, method and tools and techniques used for data collection to conduct the study. Chapter 4 contains the results of the study and a comprehensive analysis of the data collected. Chapter 5 provides the discussion and conclusions based on the findings of the study. This chapter also consists of limitations, and recommendations for further practice and future research.

Chapter 2: Literature Review

This chapter presents a review of relevant literature on backward design of curriculum with an emphasis on Understanding by Design curriculum framework. The review is presented under the themes such as: Backward Planning of Curriculum, Understanding by Design, Designing Assessment and Instruction, and Effective Teachers and Professional Development. The purpose of this chapter is to discuss the significance of designing curriculum backward through the scholarly lens of the intellectuals.

Historical Perspectives

The history of education reform in the United States dates back to 150 years ago when the struggle for quality education in the elementary and secondary schools emerged along with the establishment of public schools (Friedman, 2011). It is believed since that time that education and schooling are the major sources for creating rational citizens of the society that are competent and have essential skills to shape the future of the nation. The first half of the 19th century of America was the time of social changes and development. It was the time of industrialization and urbanization (Rury, 2002). He wrote, "Industrialization stimulated sweeping social change, and this too influenced the development of schooling" (p. 55).

However, the traditional curriculum was emphasized during that period. Education was overpowered with the influence of faculty psychology that claimed, "mind as a muscle" that needs extensive exercise through memorization and recitation (Kliebard, 2004; Pinar et al., 1995 as cited in Plate, 2012). The education reformers of that time severely criticized this educational system. Tanner and Tanner (1990) elucidated that the reformers believed that this system "had originally evolved to serve an aristocratic society and, in addition to being absolutely unfounded from a scientific standpoint, it did not meet the new social and industrial demands of a

democratic society" (as cited in Plate, 2012, p. 1313). To reform the standardized curriculum that focused only on college preparatory programs, the National Education Association (NEA) and the Committee of Ten were established in 1870 and 1892 respectively, and the few more years of the initiations of a variety of regional educational associations that dealt with high school standardization issues such as curriculum, school day length, and quality of instruction were observed (Friedman, 2011). Until then, school curricula did not incorporate vocational subjects that meet the needs of students of the industrial era (Friedman, 2011). Hence, in the late 19th century educationists planned procedures and reformed curricula that aimed at focusing on a wide range of learner's interests and honing their ability to gain hands-on experiences to meet the needs of society (Plate, 2012).

The early 20th century was the time for immense change and development, the period of progressivism when major principles of the current governmental policies, public institutions and modern school system were established (Rury, 2002). Known as the Progressive Movement, there was a transformation to a new educational philosophy that prioritized integration of diversity, incorporating school with community, and on focusing on children's growth and understanding with innovative pedagogy what is now called child-centered instruction (Bowles and Gintis,1976; Plate, 2012; Rury, 2002). It was then that "professional standards had been established for much of the nation's teaching force, with normal schools and teacher training departments existing in hundreds of high schools, colleges, and freestanding institutional forms" (Rury, 2002, p. 89).

During this time there were increased enrollments in high schools. Dewey, Bobbitt, and Kilpatrick were prominent figures in advocating curricula that emphasize the learner's needs and improve life skills to attain the society's demand (Rury, 2002). Most schools implemented the

revised curricula, however "the instructional result was often a modified version of traditional education" leading to the conflict between the needs of youth and academic curricula (Friedman, 2011, p. 20). Yet, progressivism could not refrain criticism during these years. Contrary to its educational philosophy, in practicality the large-scale national curriculum was dominant to produce wage-labor force (Rury, 2002). The launch of Sputnik and the civil right movements were the root cause for the then reformers to emphasize on academic curriculum to bring desired improvements (Plate, 2012). Fullan (2005) asserts that the period had realized the 'urgency' of the need of educational reform and the need of creating citizens competent enough intellectually and skillfully to contribute to and from the global economy. Friedman (2011) summarizes:

> One common thread running through the major education reforms of the 1980s was a focus on academic standards. Increased economic globalization and rapidly advancing technology led many, particularly in the business community, to worry that American students would not be sufficiently prepared to lead the U.S. economy in a more competitive environment. (p. 27)

Educational institutions observed a great pressure and incentives were settled for the innovations on large scale national curriculum reform from the federal government (Fullan, 2005). However, there was an abundant manifestation that "The innovations were adopted on the surface with some of the language and structures becoming altered, but not the practice of teaching" (Fullan, 2005, p. 15). He further affirmed that the educational system at that time failed to create such desirable competent citizens because one cannot expect reform to take place only by implementing policy since policy needs to be practiced by the institution and the whole organizational structure.

On the other hand, the 1990s saw the birth of the state standards movement. The No Child Left Behind Act pressured teachers to teach to the test concentrating mainly on topics to be covered for standardized tests (Friedman, 2011). The significance of this development was that "curricula of the schools ought to be aligned with systems of assessment, so that reliable estimates could be made of what children were learning and of how well the schools were performing their instructional mission" (Rury, 2002, p. 220). He further stressed that learning standards in the major subject areas have been identified by most of the states and were set as goals and objectives for the teachers to plan and meet them by the end of the instruction.

The change in the immediate society, educational reform, and standards-based movements demand change or adjustment in the curricula and enhance literacy instruction that ensure effective teaching learning (Tomlinson et al., 2003). They emphasized that the change in the curriculum development, instruction, and assessment has become essential for the holistic development of students. According to Fullan (2005), schools and teachers are 'moral change agents' and their main purpose is "to make the difference in the lives of students and to make changes that matter" (p. 21). To bring changes in the lives of students, and to nurture them socially and intellectually, it is essential to have a strong curriculum framework, quality instruction and appropriate assessment (Tomlinson et al., 2003). Therefore, planning or designing curriculum needs to integrate essential components such as teachers' knowledge of content and pedagogy, their knowledge of students, knowledge of resources, instructional goals, instructional planning, and appropriate assessment for students (Kelting-Gibson, 2005). The curriculum framework known as "backward design" emphasizes on the teachers' planning to meet these components.

Backward Planning of Curriculum

Teacher educators are well aware of the fact that students tend to forget whatever they were taught if a large amount of content presented to them is inapplicable and irrelevant for them to apply in an unfamiliar situation (Jenkins, 2005; McTighe & Wiggins, 2012a). Jenkins agreed with what Herb Childress (1998) and Deci (1995) believed that students work reasonably well with the information they received, particularly by rote memorization, just to pass a test or to get good grades. They observed that students eventually forget what they have learned once the tests are over because they are not focused on learning the concepts in depth and process them (as cited in Jenkins, 2005). The reason for this is an approach called coverage in which "students march through a textbook, page by page (or teachers through lecture notes) in a valiant attempt to traverse all the factual material within a prescribed time" (McTighe & Wiggins, 2005, p. 16).

Until recently, the majority of teachers relied on textbooks that superficially cover large number of topics as a source of structured instructional materials for curriculum delivery (Chingos & Whitehurst, 2012; Gak, 2011; McTighe & Wiggins, 2011; U.S. Department of Education, The National Center for Education Statistics, n.d.; Oakes & Saunders, 2002; Polikoff, 2015; Porter, 2002; Woodward & Elliott, 1992). Students are required to gain knowledge from the textbooks' content and practice tests in order to meet the state standards and raise test scores (McTighe & Wiggins, 2012b; Oakes & Saunders, 2002). McTighe and Wiggins (2012a) believed that curricula with just a series of content and activities are not the best ones. Prescribing such a curriculum just for the coverage may help students learn superficial content knowledge but will, in fact, impede development and understanding of core ideas of the taught content (Hattie, 2003; McTighe & Wiggins, 2012a). Jacobs (2010) stressed that teachers are required to take the challenge of preparing students for the rapidly changing world and, for this reason, teachers

themselves need to increase their understanding and acquire abundant knowledge of different innovative approaches to teaching. However, he claimed that school curriculum constitutes the outdated system that leads students to nowhere, not even fit for contemporary society; meaning students are offered content with information that is mostly outdated, uninteresting, unrelated to their social experiences, and distinct from the crucial needs of life skills.

Contrary to this, curriculum with backward planning design emphasizes identifying and setting the objective as the first and primary act, then determining assessment and activities (McTighe & Wiggins, 1999, Wiggins & McTighe, 2005). They referred to Stephen R. Covey's quote "start with the end in mind" matching it with the metaphor of setting off for a journey by aiming at first the endpoint (destination), providing oneself with ample road-map planning and equipping with required tools in order to approach the set goal/s. The underlying concept of Backward Design centers on the big ideas and enduring understanding that enables students to remember long after they leave school (Mills et al., 2019). Similar to Tyler's rationale centering on the idea of performance-based learning objectives, followed by identifying the instructional approaches that lead to attaining experiences, and finally evaluating the student's performance as desired outcomes (McTighe & Wiggins, 2012b; Wraga, 2017), backward design is an approach to conceptualize and construct curriculum that helps scaffold students in comprehending and responding to complex tasks and to become self-directed learners (McTighe & Wiggins, 2012b). Wiggins and McTighe (2007) found that the application of backward design involves constant analysis and revision of the courses that can build enduring understanding in students. The authors suggest that a curriculum is required to be recursive; that takes revising and reconsidering the crucial elements continuously until the purpose is entirely understood. They also emphasized that it enables educators to align the instruction and assessment with the

curriculum to attain desired outcomes. "This approach encourages teachers and curriculum planners to first 'think like an assessor' before designing specific units and lessons" (Wiggins & McTighe, 2005, p. 18). This design prioritizes the learners' diverse needs, their knowledge and experience of the world around them and how they construct meaning out of it, transferring their learning into real-life situations (Wiggins & McTighe, 1998, 2005). The authors stressed that backward curriculum framework helps learners to be more productive, and knowledgeable, and facilitate them in improving critical thinking, developing an enduring understanding with abundant backup for acquiring academic attainments and success in every aspect of life. McTighe and Wiggins (2011) also affirmed that learning is dependent on aspects like prior knowledge, social interaction, beliefs, and contextual factors. Therefore, assimilating knowledge with the existing experiences and knowledge of the learners is an integral part of backward planning (McTighe & Wiggins, 2011).

Understanding by Design

The concept of Backward Design dates back to 1949 as the innovative idea of Ralph W. Tyler, an honored and critically acclaimed educator who devoted his career to helping people boost their problem-solving skills for handling difficult and complex situations (Kridel, 2010). Although he did not use the specific terminology *Backward Design*, his rationale was regarded as the stepwise process that starts with "identifying objectives, selecting, organizing and evaluating experiences" (Kridel, 2010) primarily as analyzing and interpreting the existing curriculum. Later a similar idea of backward design was introduced, and the term "Understanding by Design (UbD)" was coined by Jay McTighe and Grant Wiggins in 1998. Wiggins and McTighe (2011), explained "Understanding by Design is predicated on the idea that long-term achievement gains are more likely when teachers teach for an understanding of

transferable concepts and processes while giving learners multiple opportunities to apply their

learning in meaningful contexts" (p. 4).

Wiggins and McTighe (1998) described UbD as a procedure that keeps learners in mind

as a crucial element of education and by seeking and making deep learning happen through

uncovering knowledge and understanding. They also described UbD as a process that provides

tools and guidance for educators to design curriculum and instruction that support students for a

deeper level of understanding and transfer their understanding in real-world situations (Wiggins

& McTighe, 1998). According to Childre et al. (2009), it is possible to design a curriculum that

fits the learning needs, develop a deeper understanding, and makes learning meaningful and

relevant. However, for many teachers designing curriculum and developing instruction that

scaffolds learning is a major paradigm shift (Childre et al., 2009). The change in the immediate

society, educational reform, and standards-based movements demand the change or adjustment

in the curricula and enhanced quality of instruction that ensure effective teaching and learning

(Tomlinson et al., 2003; Wiggins & McTighe, 2011). They emphasized that the change in

curriculum development, instruction, and assessment has become essential for the holistic

development of students. According to Fullan (2005), schools and teachers are 'moral change

agents' and their main purpose is "to make the difference in the lives of students and to make

changes that matter" (p. 21). He stressed that to bring changes the lives of students, and to

nurture them socially and intellectually, it is essential to have a strong curriculum framework,

quality instruction, and appropriate assessment. Besides, planning or designing a curriculum

needs to integrate essential components such as teachers' knowledge of content and pedagogy,

their knowledge of students, knowledge of resources, instructional goals, instructional planning,

and appropriate assessment for students (Kelting-Gibson, 2005). Understanding by Design

(UbD) promises to guide teachers to design curriculum, instruction, and assessment, to clarify the learning goals to be achieved, and to ensure students' learning through enduring understanding (McTighe & Wiggins, 2012a). As Tomlinson and McTighe (2006) write:

> Educators need a model that acknowledges the centrality of standards but that also demonstrates how meaning and understanding can both emanate from and frame content standards so that young people develop powers of the mind as well as accumulate an information base…Understanding by Design addresses that need. (p. 1)

According to Wiggins and McTighe (2005), teachers play a critical role in designing curriculum with the end in the mind and formulate effectual assessments that interpret students' in-depth understanding and devise instruction that boosts students' long-term knowledge and skills. In correspondence with the aforementioned concept, Childre et al. (2009) asserted that the Understanding by Design approach serves teachers as a guide in thoughtful planning and designing curriculum and instruction. However, it is imperative that teachers understand the difference between student knowledge and student understanding while implementing a backward design approach and design curriculum and instruction that targets the outcomes (Childre et al., 2009). The term *understanding* has diversified meanings, yet here it implies more of a subtle instruction and assessment rather than a mere attempt of teaching and testing to detect students' *knowing* facts (Wiggins & McTighe, 2011). Understanding by Design "is an attempt to better understand 'understanding' especially for purposes of assessment" (Wiggins & McTighe, 2011, p. 4). In addition to this, in the process of designing curriculum teachers are required to have ample content knowledge and general pedagogical knowledge as Shulman (1986) suggested, as well as vertical and horizontal curricular knowledge for instructing and assessing students. Designing curriculum requires teachers to align it with the common core standards and

prepare students progressively for the next challenges in the next grade-level (Shulman, 1986 as cited in Graff, 2011). In line with this perspective, McTighe and Wiggins (2012) stated:

> Educators must translate standards into a teachable curriculum to ensure a guaranteed set of desired results. Since standards documents often contain a mix of knowledge, skills, conceptual understandings, transfer abilities and habits of mind, it is necessary to "unpack" them to clarify the desired results and develop appropriate assessments and instruction. The Common Core Standards have been developed with long-term outcomes in mind and their components are intended to work together. It is important for educators to understand the intent and structure of the Standards in order to work with them most effectively. (p. 2)

Understanding by Design assists teachers in unpacking and transforming content standards into meaningful and relevant elements in Stage 1 and appropriate assessments in Stage 2 (McTighe & Wiggins, 2012a). UbD helps teachers to support students in understanding the "Big ideas" and transferring their knowledge and skills with meaningful application in different situations inside and outside the classrooms (Wiggins & McTighe, 2005).

Along with unpacking the standards, Wiggins and McTighe, (2007) recommended 10 essential components curriculum planners should consider when using Understanding by Design in their curriculum planning:

1. Mission-related accomplishments and curricular philosophy: The authors (Wiggins & McTighe, 2007) viewed that the foremost mission of any school should be developing learners' understanding of the subjects they learn and apply them in and outside of school. They demanded that the construction of the curriculum needs to focus on the core content and program area that aims at accomplishments of targeted long-term

objectives and that ensures students' learning and in-depth understanding. They also recommended that district curricula need to have a curriculum statement that explains the mission and vision of teaching and learning, and the role curriculum plays to realize them.

2. Understandings and essential questions derived from mission and content standards: Wiggins and McTighe (2007) stressed that identifying Big Ideas as essential questions are crucial for ensuring thorough understanding which is enduring and transferable. They opined that "Big ideas are framed around provocative essential questions that focus teaching and learning and help uncover the content…and are framed in understandings that students are helped to realize as a result of different lessons, units, and courses over time" (pp. 66-67). Wiggins and McTighe (2005) agreed that content standards are guidelines to teaching and learning and curriculum development, however, they pointed out the content standards set by the state are so typically composed either with voluminous or with too small content knowledge and skills that challenge curriculum planners and teachers to frame essential questions and performance goals in their instructions and assessments.

3. K-12 curriculum mapping: Wiggins and McTighe (2012) believed that curriculum mapping is another essential component for organizing the scope and sequence of a curriculum that provides teachers with the blueprint of instructions and their outcomes and guides them in supporting students in developing skills and knowledge at their various growth levels. Curriculum mapping, they stressed, ensures that all required knowledge and skills are instilled in students. However, they observed that many curriculum maps do not include and emphasize the goals that teachers would

seek for ensuring the students achieve them. They believed that such curriculum maps "replicate the inadequacies of state standards when they merely offer an analytic breakdown of instructions in terms of inputs without revealing the desired accomplishments and how to assess them related to the mission and program goals" (Wiggins & McTighe, 2007, p. 75). At this point, Guskey (2003) also suggested that assessments designed for high scoring do not help teachers improve their instruction. He maintained that assessments that are administered on a regular basis, from which teachers can receive immediate results to analyze the individual student-level data and plan and implement appropriate instructions, increase students' opportunities to learn.

4. Cornerstone assessments and collections of evidence: According to Wiggins and McTighe (2007), there should be a clear communication of the assessment process for the learning activities and outcomes to an individual student. They advocated for the cornerstone assessments to collect information as evidence of students' attainment of goals through tools like portfolios that showcase students' learning, understanding, growth, improvement, and development over a period. The authors affirmed that portfolios provide teachers with abundant information about the students' effort and progress on learning and understanding as they are also involved with the teachers for the accomplishment of their goals.

5. Analytic and longitudinal rubrics: Similarly, the authors proposed for using rubrics as evaluation tools that "help clarify instructional goals and serve as teaching and learning targets" (Wiggins & McTighe, 2007, p. 94). Rubrics are the criterion-based scoring guide that consist of a fixed measurement scale and a detailed description of

features for each level of performance (Wiggins & McTighe, 2005). Rubrics provide

teachers and students with indicators and criteria across the full spectrum of degrees

of understanding and performance. Teachers use the indicators and criteria to score

students' performances more fairly, and students use them in preparing for their

assessments since rubrics enable them to identify the standards for their performance

in advance and help them to be more competent (Wall & Ryan, 2010).

6. Anchor Work Samples: Wiggins and McTighe (2007) contended, "Anchor work

   samples are examples of student performance that characterize each of the levels on a

   performance scale" (p. 95). They argued that anchors help teachers and students

   understand and apply the standards and criteria allowing teachers to evaluate

   students' performance levels and allowing students to assess their own performance

   in self and peer-assessment.

7. Suggested learning activities, teaching strategies, and resources: Another suggestion

   of Wiggins and McTighe (2007) is the use of the understanding-based curriculum

   guide that enables teachers to exercise instructions that support constructive learning.

   They believed that the guide helps teachers to employ various strategies and

   techniques for encouraging the active engagement of students where they make sense

   of the tasks through forming structures, concepts, and principles that can be applied in

   a real context. Other than covering the content, teachers facilitate students to

   understand the key ideas and transfer their understandings by making meanings from

   their own experiences (Wiggins & McTighe, 2007).

8. Diagnostic and formative assessments: Similarly, the authors advocated for diagnostic

   assessments that assist teachers to learn about the strengths and weaknesses of

students and plan different teaching approaches. They elucidated that diagnostic

assessment enables teachers to seek constructive and authentic approaches to

instruction that assess and improve students' different abilities and that results as an

outcome-based education. Correspondingly, formative assessment and the abundant

use of feedback while designing a curriculum is highly recommended (Wiggins &

McTighe, 2007). They believed that formative assessment is an effective approach

that guides teaching and learning and shapes students' knowledge and skills. It is the

process of observing numerous tasks performed by the students and accumulating

information on their understanding, knowledge, skills, and behavior for their future

improvements (Wiggins & McTighe, 2005). They pointed out that diagnosing what

students lack and providing feedback is the crucial aspect of instruction, and feedback

assists students in carrying out meaningful activities to improve their understanding

and skills and allow them to verify what they have mastered over and what they need

to improve.

9. Suggestions for differentiation: The authors also recommended that curriculum

design needs to be revised to suit students' different needs. They argued that

instructions and assessments need to be tailored in accordance with students' diverse

needs, interests, behavior, and skills. Wiggins and McTighe (2007) suggested that a

curriculum is effective when it includes both pre-assessments and ongoing

assessments to identify students' needs, readiness, and interests and collect evidence

to make appropriate adjustments, respectively.

10. Troubleshooting guide: Their final recommendation is a result-based troubleshooting

guide. The authors observed that there are many times that teachers find themselves

in an awkward situation and do not know how and where to find answers to the

problems (Wiggins & McTighe, 2007). They remarked that as a help desk for

teachers, there must be space in the curriculum for the guide with the matrix to be

filled by experienced teachers about the "possible causes and solutions for predictable

problems" (p. 106) that will help teachers to identify any problem and seek a solution

from the guide.

Understanding by Design is not a pedagogical philosophy or an educational program,

instead, it is a curriculum framework (Brown, 2004; Wiggins & McTighe, 2005). In traditional

forward design, textbooks become the essential tool to select lessons and create activities

followed by assessments, whereas backward design identifies the desired results or goal/s to be

achieved before planning instruction (Wiggins & McTighe, 1998). This design is completely

based on the idea that a plan becomes successful if it starts with the end in mind. The general

process in planning a backward curriculum using the UbD framework involves *three stages* that

are interrelated and aligned with the standards (McTighe & Wiggins, 2012a).

Stage 1—Identify the Desired Result

As maintained by Wiggins and McTighe (1998, 2005, 2011, 2012), the first stage is to

identify what knowledge and skills students will achieve at the end of a lesson. This stage allows

educators to review the existing curriculum and the district standards. They viewed it as

necessary for teacher educators in identifying curricular priorities starting with the content

standard and finding the specific learning goals and their possible applicability in the real world.

In their opinion, identifying the significance of the lesson enables teachers to align the

curriculum with the targeted goal by making the selection of content crucial for learners'

understanding and transferring of knowledge. And using essential questions is equally important

in supporting students to develop and deepen their knowledge, and to build an essential understanding of the big ideas.

Stage 2—Determine Acceptable Evidence

The second stage, according to Wiggins and McTighe (1998, 2005, 2011, 2012), is to explore ways to assess the understanding and knowledge that students have achieved. Unlike traditional assessment, they argued, UbD enables educators to employ much deeper assessments that measure students' performance, which is associated with the process of their knowledge, interests, needs, attitudes, and personalities. Wiggins and McTighe (2005) suggested "teachers and curriculum planners to 'think like an assessor' for determining how students will attain the desired understanding" (p. 18). Understanding, as Wiggins and McTighe (2005) stated, cannot be defined in a single term for multiple usages. Its definition varies depending upon different situations and different usages making it more complicated. A true understanding emerges if different aspects of understanding are identified in a true sense (Wiggins & McTighe, 2005). UbD proposes six facets of understanding through which students can demonstrate their true understanding and transfer their learning. The following are the six facets of UbD that serve as indicators or frames for the different types of assessment teachers use to reveal understanding as transfer (Wiggins & McTighe, 2011):

1. **Explanation.** Explain what, why and how, describe, demonstrate, make a generalization, illustrate, illuminate, perform, make connections, and exhibit interconnections between ideas.

2. **Interpretation.** Draw inferences, construct meaning, bring relatable ideas and concepts, create their own understanding through anecdotes and analogies.

3. **Application.** Practice the knowledge and understanding in the real-life context, use the knowledge for problem-solving in a difficult situation.

4. **Perspective.** Recognize complex situations and have a critical and different point of view to look at them, analyze and make assumptions about the situations.

5. **Empathy**. The ability to be in another's shoes, understand other people's situation, value their viewpoints and conditions, respect their emotion and feelings, identify the cause of their reactions before being judgmental.

6. **Self-knowledge.** Self-reflection of self-actions, self-assess and self-evaluate, be aware of one's own actions and flaws in them and be accountable for adapting own conception of facts and reshape own opinions.

Wiggins and McTighe (2005) claimed that the six facets of understanding are the means that help validate students' understanding of certain topics or content. However, it is not necessary that teachers use all the six facets when assessing students' understanding (McTighe & Wiggins, 2012a). Any of the six facets determine the level of understanding that students attain. And the in-depth understanding of the learning encompasses all the six levels which students can demonstrate as progressive learners at the end of the grade level and even after their graduation from school (Wiggins & McTighe, 2005). Brown (2004) has a similar viewpoint when he stated, "Enduring understandings are statements that clearly articulate big ideas that have lasting value beyond the classrooms and that students can revisit throughout their lives" (p. 17).

Stage 3—Plan Learning Experiences and Instruction

As affirmed by Wiggins and McTighe (1998, 2005, 2011, 2012), the final stage is to confirm what systematic tools and approaches will be used to achieve the expected goal. In this stage, teachers plan to align learning experiences and instructions with previously set goals and assessments. They plan instructional activities that provide students with opportunities to develop and deepen their understanding of the key ideas (Wiggins & McTighe, 2005). Students are given numerous opportunities to transfer their learning and are supported as teachers *equip* and *enable* them to perform with understanding. "By using the terms *equip* and *enable, …*we are *equipping* students for performance; we are *enabling* them to perform with understanding, with increasing autonomy" (Wiggins & McTighe, 2005, p. 209). For equipping learners, Wiggins and McTighe (2005) recommended that teachers require sufficient planning in order to enable learners to transfer learning. Since the authors found flaws in teachers planning in equipping learners, they suggested teacher designers "to provide more concrete experiences of the ideas in question, linked to essential questions, to indicate the kind of transfer sought" (p. 209). According to them, thoughtful and well-planned instructional activities enable teachers to address the purpose of learning by scaffolding learning and helping students to find the gap between their performance and their goal. This also empowers students to actively construct meaning using inquiry, performance, and reflection and transfer understanding in unfamiliar situations (Wiggins & McTighe, 2005, 2011). Along with thoughtful planning, Wiggins and McTighe (2005) recommended teachers to use WHERETO, an analytical tool, for building and testing the elements of the design. WHERETO is an acronym for Where, Hook, Equip, Rethink, Reflect, and Revise, Evaluate, Tailored, and Organized. They explained that this tool helps teachers to:

ensure that students understand *Where* and *Why* the unit is headed; *Hook* students in the beginning and *Hold* their attention throughout; *Equip* students with necessary experiences, tools, and knowledge to meet the performance goals; provide students with numerous opportunities to *Rethink* big ideas, *Reflect* on progress, and *Revise* their work; build in opportunities for students to *Evaluate* progress and self-assess; be *Tailored* to reflect individual talents, interest, styles, and needs; be *Organized* to optimize deep understanding as opposed to superficial coverage. (pp. 197-198)

They remarked that teachers have the decisive roles to develop tools and techniques that address students' needs and support them to perform autonomously. Planning effectively and equipping students adequately allows students to reflect on their thinking, reveal their understandings, and transfer it in the real-world situation even after the scaffolding is removed (Wiggins & McTighe, 2005, 2012).

The figure below demonstrates the three stages that need to be followed while planning backward design curriculum:

Figure 1

Three Stages of Understanding by Design (Wiggins & McTighe, 2005).
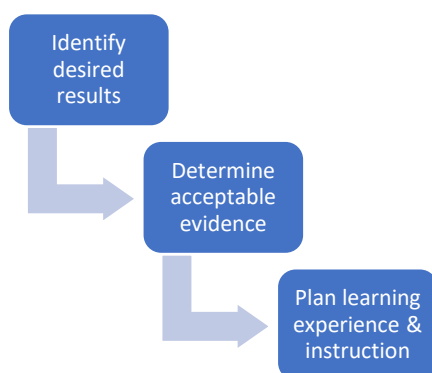
Thus, as Wiggins and McTighe (2005) suggested, a curriculum must help students to not only grasp what is covered but also to actively uncover facts, ponder ideas, and construct reasonable thoughts. The curriculum must be designed to develop students' learning as meaning-making by making sense of the situation through questions, inquiry, and analysis (Wiggins & McTighe, 2005). They further argued that familiarization with the goals and objectives and planning valid assessments such as performance tasks, quizzes, tests, and self-assessment as evidence prove to be a great source to effective learning and achieving intended outcomes. Planning and executing learning experiences and instruction with suitable approaches, reliable resources, and activities enable learners to gain appropriate skills and empower them to be potential performers rather than sideline observers (Wiggins & McTighe, 2005).

Designing Assessment and Instruction

Teaching is a decision-making endeavor that requires teachers to decide what they want their students to learn, to plan and execute the planning to promote learning, and to determine if the plan worked (Popham, 2009). Accomplished teachers are able to bring and share professional knowledge pertaining to making good curriculum decisions (Darling-Hammond, 2010). A quality curriculum entails the combination of well-organized goals, intellectually challenging assessments for students and robust instruction supported through strong instructional materials (Darling-Hammond, 2010). In this decision-making process when teachers determine how students should spend their instructional time, Popham (2009) recommended teachers to think about instructional activities and materials through the lens of assessment. This is precisely what the backward planning of curriculum begins by identifying the outcome that students will achieve, then using assessment to determine acceptable evidence before designing learning experience (Wiggins & McTighe, 2005).

Planning and designing curriculum involve prioritizing the achievement of a small or limited number of curriculum objectives so that students obtain deep conceptual knowledge and develop essential skills (Glatthorn et al., 2001). Tomlinson, Brimijoin, and Narvaez (2008) have the same opinion that while planning curriculum and instruction, educators need to focus on the essential knowledge, understanding, and skills students need to learn. And if they do so, it is more likely students will achieve their desired goals. The best-practice curriculum, as stated by Wiggins and McTighe (2005), is the one that specifies what students should accomplish before they move to the next level, and what teachers and students are required to do in order to achieve the desired goal. In a standard-dominated education system, rather than just serving up the curriculum (Tomlinson & McTighe, 2006), teachers must unpack and translate the content standard into a teachable curriculum and construct appropriate instruction and assessment in order to pursue the targeted outcomes (McTighe & Wiggins, 2012b).

Assessment is crucial in effective teaching and learning as it enables teachers to determine whether or not learning has taken place and assists them to improve their instruction and plan for future learning opportunities (Guskey, 2003; Law & Eckes, 2007). However, most assessments that are used in most states are designed for ranking schools or students and majority of teachers consider them as evaluation tools to be administered at the end of the lesson for grading students (Guskey, 2003). As Wall (2005) stressed that such assessments are high-stake summative assessments that do not take account of students' understanding, skills, interests, and needs, and that hardly provides learners opportunity to develop their skills and knowledge. In fact, the high-stake assessments associated with accountability might have a distorting effect on student's learning and teachers' practice on classroom assessment (Wall,

2005). Putting their view on the custom of requiring students to practice tests in order to meet the state standards and raise test scores, McTighe and Wiggins (2012) stated:

> For many educators, instruction and assessing for understanding are viewed as incompatible with high-stakes accountability tests. This perceived incompatibility is based on the flawed assumption that the only way to raise test scores is to cover those things that are tested and practice the test format. By implication, there is no time for or need to engage in in-depth instruction that focuses on developing and deepening students' understanding of big ideas. (p. 8)

Understanding by Design encourages teachers and educators to use two types of assessments as evidence of student learning-performance based assessment and traditional assessments like quizzes, test, and writing assignments (McTighe & Wiggins, 2012a). Because both types of assessments provide information for improving learning and teaching as an interactive process between students and teachers that informs them how well their students are learning and what they are teaching (Goodwin-Glick, 2017). Referring to summative assessment and ongoing formative assessment such as performance-based assessment, Briggs, Woodfield, Martin, and Swatton (2008) suggested three main concepts associated with assessment: "Assessment *for* learning, Assessment *as* learning, and Assessment *of* learning" (p. 2). They believed that assessment for learning is a continuous process that plans for future instruction and review about the progress of teaching learning. Likewise, assessment as learning applies different learning approaches and helps learners to be aware of their role in their own assessment, whereas assessment of learning is a summative assessment that summarizes what students have learned. Assessment that is formative is a process-oriented approach in which

teachers and school leaders remain conscious of physical, psychological and academic needs of students and can identify other areas for improvement (Goodwin-Glick, 2017).

Some 22 years ago, Paul Black and Dylan Wiliam (1998) conducted research to seek answers for their questions: Do improved formative assessments raise standards, is there a room for improvement, and what kinds of practices are included to improve formative assessment? After studying 580 articles and reviewing 250 scientific rigorous materials backed by the strong evidence, they concluded that "formative assessment is an essential component of classroom work and that its development can raise standards of achievement. (Black & Wiliam, 1998, p. 148). From their findings, Black and Wiliam asserted that if instructionally oriented assessments are implemented effectively in a classroom, it will undeniably become a powerful means to improve students' learning (Popham, 2009). Assessment should always enhance educational values, fulfill an institutional mission and effective student activities, so that educational needs of students are served (Gullickson, 2003 as cited in Law & Eckes, 2007). Assessment provides information for improving teaching and learning as an interactive process between students and teachers that informs them how well their students are learning. Therefore, "when instructors change their practice in assessment, students also change their behaviour so that everyone shares responsibility for the students' learning and improvement of learning environments" (Mikre, 2010, p. 104).

Assessment is part of the learning process that does not just judge learning on the basis of a grade or score, but also addresses what teachers do in regard to classroom observations, activities, assignments, and tests, including collecting information and providing timely positive feedback constantly and supporting through different teaching strategies (Guskey, 2003). He further maintained that assessments designed for high scoring do not help teachers improve their

instruction, but assessments which are authentic and are administered on a regular basis, from which teachers can receive immediate results to analyze individual student-level data and plan and implement appropriate instruction increase students' opportunities to learn. Authentic assessment enables teachers to seek constructive and authentic approaches to instruction that assess and improve students' different abilities and that results as an outcome-based education (Wiggins & McTighe, 2005). In view of the fact that assessment is the process of finding out about what students can do and where there may be difficulties (Briggs et al., 2008), it should not surprise students but instead it should manifest the core concepts or skills that are emphasized in their class including their teacher's criteria for judging their performance (Guskey, 2003). Black, Harrison, Lee, Marshall, and Wiliam (2004) also opined that assessments must be made clear and transparent to the learners so that it would enable them to have a clear and explicit view of their endeavor and make them identify what it means to complete it successfully. Clarification of the assessment process helps learners to be informed of what they should consider important in learning, how they spend time on it, and how they come to see themselves as students (Mikre, 2010).

Formative assessment is not just a collection of informal information of each individual student or just making instructional adjustment based on students' confusion over a concept or skill, but a proper planning to make changes in the instructional practices and classroom environment based on the assessment-elicited evidence which is also shared with students to assist them in improving their own learning (Popham, 2011). Formative assessment is multifaceted and has multiple assessment measures to assess students' understanding and is used to make instructional decisions by contemplating differences in students' needs and interests (McGlynn & Kelly, 2017). Teachers are required to determine which formative assessment to

employ in their classroom because choosing the right assessment helps them for proper planning and preparation for future instruction that ensures success (Popham, 2011). To address the assessment-identified challenges and to engage students in different and productive learning experiences, it is desirable that high-quality, correctively designed instructions follow the assessment (Guskey, 2003).

Guskey (2003) further elaborated that implementation of high-quality, corrective instruction requires teachers to use different approaches to instruction that address students' varying needs and intelligence. Pertaining to the backward design process when teachers plan to align learning experiences and instructions with previously set goals and assessment, they tailor instructional activities that provide each individual student with opportunities to develop and deepen their understanding of the key ideas (Wiggins & McTighe, 2005). The quality of teaching improves if teachers develop their ability to scaffold learning goals for students and adapt instruction to meet individual learning needs (Kapambwe, 2010). Classroom instruction guarantees to be effective if teachers emphasize the four significant elements–whom teachers teach, where they teach, what they teach, and how they teach to meet the varied needs of learners (Tomlinson & McTighe, 2006). In a heterogeneous classroom, it is important for teachers to know each of their learners, understand their differences, interests, abilities, experience, and needs, and tailor instruction in order to create the best learning experience (Bender, 2002; National Research Council, 2002; Tomlinson, 2000).Teachers are required to re-invent their passion for teaching and identify and accommodate the learning differences every new student brings with them (Hattie, 2009) and adjust instruction that ensures students' personal growth and their success (Tomlinson, 2014).

Designing instruction should not be limited to giving instruction but needs to be the process of inquiry that urges students to put what they know and understand. It should be the process that encourages and involves students in gaining hands-on approaches to learning and apply learning to real-life situations (Department of Education, 2000). Nebesniak (2012) expressed her perception that effective instruction should entail teaching for understanding of core concepts, assessing and connecting learner's prior knowledge with the content, and engaging students for directing attention (Nebesniak, 2012). Her observations of the classroom instruction and the interaction with teachers and students brought in a conclusion that these three instructional elements are the key components of effective teaching and learning. Her experience resonates with the National Research Council's report (2002) that stated that effective instruction involves careful consideration of learning activities purposefully designed to allow students to connect their prior knowledge to the new concept presented to them. These activities allow each individual student to participate and help them understand and apply the concepts (National Research Council, 2002).

The key purpose of effective teaching and learning is to support student success by ensuring their learning, understanding, and skills (Tomlinson & McTighe, 2006). Childre et al. (2009) believe that while implementing backward design approach, it is imperative that teachers understand the difference between student knowledge and student understanding and design curriculum that focuses on outcomes. This implies that an effective teacher constantly orchestrates and addresses the quality of both curriculum and instruction to ensure it can support and allow each individual student to engage in meaningful tasks and understand and apply the concepts in an authentic context (Tomlinson & McTighe, 2006). In order to design instruction that targets a deeper level of conceptual understanding, thoughtful planning is required; thus,

teachers may require retraining in the process of thoughtful planning and designing instructional activities that help scaffolding learning and develop deep understanding (Childre et al., 2009).

Effective Teachers and Professional Development

Teachers influence students' lives, learning, and achievement (Darling-Hammond, 2006; Fullan, 2007; Harris, 2010; Sousa & Tomlinson, 2011). Good or bad, a teacher has a substantial, lifelong impact on students' learning and achievement (Darling-Hammond, 2006). Research indicates that students who are placed with an effective teacher in consecutive years demonstrate significant gains in their achievement compared to those assigned to ineffective teachers in consecutive years (Darling-Hammond, 2006). Tomlinson et al. (2002) believed that an effective teacher who is dedicated to a learners' cognitive and affective growth consistently creates a learning environment, designs curriculum, and uses appropriate instructional approaches to ensure student learning. In further discussion, the authors highlighted the urgency of ensuring diverse students' sense of security, affirmation, validation, affiliation, and affinity in classrooms that has a direct positive impact on their lives and learning. In their words:

> Teachers who continually strive to be reflective, respectful, and responsive, who support their students in developing those same traits, and who constantly assess the impact of environment, curriculum, and instruction on the security, affirmation, validation, affiliation, and affinity of each learner are far more likely to make a major, positive impact on the learning and lives of their students than are teachers who undervalue any of these factors. (Tomlinson et al., 2002, p. 14)

A review of research literature on child resilience highlights the magnitude of teachers' impact. It claims that one of the several factors that enable children to adapt themselves successfully are the adults, and the staggering number of cases identified them as effective

teachers (Sousa & Tomlinson, 2011). Fullan (2007) claimed that teachers who are prepared, qualified, and trained are highly rated and more successful and effective than their less prepared counterparts. It is crucial for teachers to enhance their own learning to help students boost deep understanding of the content and develop competencies in order to succeed in the contemporary society (Darling-Hammond et al., 2017). Mizell (2010) affirmed that when teachers engage in professional development to refine their practices emphasizing the skills they need in order to help students overcome learning challenges, students' learning and achievement increase. For this reason, effective professional development is a growing interest as a fundamental means to support students for acquiring increasingly complex skills to meet the 21st century demands (Darling-Hammond et al., 2017). Hence, schools and school districts use professional development as a strategy that helps teachers improve their practices, teaching quality and teaching strategies for students' academic achievement (Mizell, 2010). Garet et al. (2001) and Desimone et al. (2002), in their longitudinal study of science and math teachers, found that effective professional development with essential features have a strong effect on teachers' practice as it increased their knowledge and skills (as cited in Windschitl, 2009). Another study showed that adding a 45-minute session of professional development on the principles of efficacy and backward design curriculum over a period of 9 weeks, brought forth an increase of knowledge and the use of best practices that influenced teachers' attitudes and student achievement (Harris, 2010).

Studies indicate that U. S. educators have been departing from one-time workshops (Desimone & Garet, 2015) "because one-shot workshops were ineffective" (Fullan, 2007, p. 285) and because professional development educators now understand the importance of long-term, content and curriculum-focused professional development. In contrast to one-shot programs,

effective professional development is more likely to change teachers' practice because it engages

teachers in learning, practicing, implementing, and reflecting upon new teaching approaches over

a long period (Darling-Hammond et al., 2017). Effective professional development makes

teachers aware of where they and the students are going, how they are meeting the goals, and

helps them construct a coherent curriculum acknowledging the different needs of students

(Bransford et al., 2005).

Professional development is believed to be one of the most powerful strategies which

enable teachers to obtain a strong foundation of pedagogical content knowledge, find alternative

approaches to teaching, seek resources, assess student understanding, and carry out effective

classroom activities to enhance student learning (Gollub et al., 2002). There is now a growing

consensus on reform-oriented professional development because of its positive effect as it is

interactive to their teaching practices, focuses on content-knowledge, focuses on teachers'

collective participation, active learning opportunities, obtaining feedback, self-reflections, has

coherence with other learning activities, and provides mentoring and coaching (Windschitl,

2009). As mentioned by Mohan (2011), teachers in their professional life seek to support student

learning through their professional growth, which is possible through motivation, collaboration,

and mentoring as they are essential factors in a shared profession with the shared vision to bring

positive change and potential advantages to approach the educational interests. Fullan (2007)

also believed that collective learning, collaborative involvement in wide- scale curriculum

change, and continuous professional development facilitates teachers' understanding of the

purpose and philosophy of the curriculum adequately and they can initiate transformation among

students and in education. Similarly, mentoring and coaching in professional development

reinforces personal strengths, self-esteem and self-awareness and helps continue to impact and

grow simultaneously and accomplish the major goals (Diaz-Maggioli, 2003). There are other means such as curriculum guides or texts that help teachers to address the district and state expectations, but these cannot help teachers to connect their approaches to students' readiness and interests (Darling-Hammond, 2006). It is only through professional development that teachers can make appropriate curriculum planning, focus on the teaching strategies, observe and reflect, embrace new techniques and new ideas, take personal responsibility for their growth, and take their own informed decision to refine their practices in order to support students learning (Darling-Hammond, 2006).

Chapter Summary

The purpose of the literature review was to help readers understand the significance of designing curriculum backward with the aim of enhancing learners' knowledge and understanding of the core concepts. The review of the literature suggested that Understanding by Design is widely practiced as the backward design curriculum framework in schools and universities. The reviewed literature recommended that the principles and the essential elements of UbD should be implemented effectively to teach for deep understanding and to improve learners' understanding and performance. More research is required to obtain information on the impact of UbD in students' performance and achievement. It is also important to conduct research on the challenges teachers face while implementing and practicing Understanding by Design.

Chapter 3: Methodology

The purpose of the study was to examine teachers' planning of curriculum, instruction, and assessment using the essential elements and the three stages of Understanding by Design in the select school districts in central Minnesota. The researcher also intended to investigate to what extent the key principles and the essential elements of UbD were practiced for enduring understanding among elementary students in K-12 public school districts in central Minnesota. The findings of the study will benefit the educators by providing further understanding of the Understanding by Design framework and assist them in identifying the fundamental principles and the essential components of UbD to improve curriculum planning, instruction, and assessment.

Research Questions

The following are the research questions that guided the research study:

1. What elements of the backward design process do curriculum directors in select Minnesota school districts report practicing for enduring understanding among elementary students in their schools?

2. To what extent do curriculum directors report that curriculum related elements are employed in the elementary classrooms in select Minnesota school districts?

3. To what extent are Stages 1, 2, and 3 of Understanding by Design used in the elementary classrooms as reported by the curriculum directors in select Minnesota school districts?

Research Design

The methodological design adopted in this study was a quantitative research design which is designed to help obtain the answers to the research questions. Quantitative method is

the systematic process of collecting, analyzing, and interpreting the data, and presenting the results (Creswell & Creswell, 2018). This methodology was preferred in this study as it provided the researcher with opportunities to address the research problem by using statistical methods to analyze teachers' practices of UbD in elementary classrooms.

Quantitative research, as clarified by Creswell and Creswell (2018), is an approach for testing the objective reality by observing and measuring the variables on instruments. They further elucidated that it is fundamental that this postpositivist approach aims at developing numeric measures of observations for studying individuals' behavior. Built upon this pragmatic worldview, the researcher employed this research methodology given that the survey questionnaires were developed by the researcher appertaining to the research questions and the literature review. The researcher intended to describe and interpret the variables on the dataset; hence, a descriptive survey was undertaken. A Likert Scale online survey was carried out, and the gathered data was analyzed descriptively. In this study, the quantitative data and the statistical results provided a general understanding of the implementation of the principles of UbD and an information of whether or not the essential components and the three stages of UbD framework had been employed effectively for improving student learning.

Purposive Sampling

According to Cohen, Manion, and Morrison (2007), purposive sampling is used by a researcher in order to get in touch with people who have in-depth knowledge about particular issues that are going to be studied. Unlike other sampling techniques intended for selecting participants randomly in order to generalize the study, purposive sampling is used for selecting particular participants of similar characteristics that would best provide the desired information. Suter (2012) was of the opinion that the researcher always collects best and useful data purposely

in purposive sampling to acquire insight from its illuminative and rich information sources. In this study, the participants were a small number of purposefully selected curriculum directors from central Minnesota school districts who had implemented UbD for designing curriculum, instruction, and assessment in their schools.

Study Participants

The participants in this study were the curriculum directors from ten school districts in central Minnesota. Utilizing purposive sampling, the researcher selected the participants that had experience working closely with teachers in developing and designing curriculum and had implemented Understanding by Design in their school districts. Emphasis was given to participants' understandings and experiences regardless of their gender, age, and ethnicity.

Human Subject Approval

The researcher followed the ethical guidelines and principles stated by the St. Cloud State Institutional Review Board (IRB) to meet the ethical aspects and decrease the chance of misleading and confusing results. The researcher completed the IRB training in 2019 and completed the IRB protocol before setting up the field work. The researcher was accountable for the key aspects of ethics such as protecting the dignity and welfare of the participants. Before collecting data by means of survey, the researcher received approval from the IRB. An informed consent with the background information and the purpose of the study was approved from the IRB and then it was sent to all the participants in order for them to accept and sign it. The consent also included information about the procedures, probable risks or discomfort, and benefits of the study. The researcher informed the participants via electronic mail that they would be protected from any type of harm, or risks that could be both physical or psychological, and the confidentiality of the participants would be maintained. The participants were informed

that their participation was voluntary, and they were free to withdraw from the study at any time. The researcher complied with the mandatory IRB process and carried out the ethical duties keeping in mind how best to respect and protect the participants while obtaining information from them.

Procedures for Data Collection

The researcher was aware of the ongoing Covid-19 pandemic and the challenges it had brought in terms of finding willing participants and finishing the study in the desired time frame. However, the researcher had undertaken this study during fall 2020. The survey method using Qualtrics software allowed the researcher to collect data about current attitudes, beliefs, and practices of Understanding by Design in the select central Minnesota school districts. To embark on the study the researcher at first obtained permission from St. Cloud State University Institutional Review Board (IRB).

Participant Consent

After having received an approval from the IRB, the superintendents of the Minnesota school districts in which the research was to be conducted were sent electronic mails requesting permission and informing them about the study. The email address to contact the superintendents were acquired from the school districts websites. Upon receiving their permission, the researcher requested they provide the curriculum directors' email addresses so that the curriculum directors could be approached via emails and be requested for their voluntary participation. The next emails were sent to the prospective participants explaining the purpose of the study and inviting them to participate in an online survey. They were requested to either approve or reject the invitation by responding to the email. The third email containing an IRB approved informed consent with the details and the purpose of the study was sent to the interested participants to be

signed. The consent letter also included the information about the content and procedures of the

study, probable risks or discomfort, voluntary participation, maintenance of participants'

confidentiality and anonymity, and the benefits of the study. The participants were informed

about the amount of time the study would take. This is an indispensable part of the research and

it often involves writing a letter that identifies the extent of time, the potential impact, and the

outcomes of the research (Creswell, 2014). The participants were also informed about the value

of research ethics and that they should contact the researcher if they had any concerns.

Throughout the study, the researcher complied with the research ethics and made adequate plans

to deal with any anticipated problems that might occur during the study. The researcher took the

responsibility to safeguard the participants by being fair and honest and by protecting them from

any physical or mental harm.

Field Survey

Creswell and Creswell (2018) defined survey design as a study that provides quantitative

information of opinions and attitudes of a large population by surveying a sample of that

population. "Typically, surveys gather data at a particular point in time with the intention of

describing the nature of existing conditions or identifying standards against which existing

conditions can be compared or determining the relationships that exist between specific events"

(Cohen et al., 2018, p. 334). The researcher employed survey research as the quantitative method

for collecting data to address the research questions. Survey research was preferred in this study

because surveys do not control or manipulate the independent variables and the researcher was

able to observe and measure the variables and test their effects at a particular time using

statistical methods (Bhattacharjee, 2012). Additionally, this research method was selected by the

researcher because of its capability of measuring a wide variety of unobservable data, feasibility

of collecting data remotely about a large population, and because of it being economical and easily accessible (Bhattacharjee, 2012). The researcher used Qualtrics as a web-based platform for administering the internet survey. The data collected through Qualtrics were managed by the St. Cloud State University Statistical Center.

Survey Instrument

The researcher developed the Likert scale survey questionnaires. The Likert scale had three segments including a demographic segment that allowed the researcher to obtain information on the size of the schools, participants' level of education, participants' experiences in their field, and the implementation of UbD in the elementary classrooms. The other two segments had a series of 26 questions with three points measuring scale under each of the three research questions. The questions reflected the essential components and the three stages of design used in the UbD framework. The essential components UbD and the three stages of backward design of curriculum were identified through the analysis of the related literature.

Following the acceptance for the voluntary participation from the participants, the Likert scale survey questionnaires were sent through Qualtrics, an online survey tool. Before sending them to the participants, the questionnaires were piloted with two different cohorts of students from Educational Administration and Leadership (EDAD) program who had understanding and experience of backward design model of curriculum at a certain level. Subsequently, the survey questions were revised and refined to send them to the actual participants. Follow-up emails were sent to the participants after a few days to yield responses in a timely manner.

Data Security

The researcher was mindful in maintaining the confidentiality of the data collected and identity of the participants. To protect the participants' identities, the researcher guaranteed the

confidentiality and anonymity of each individual respondent. Similarly, the researcher reported, interpreted, and analysed data without any biases and secured the data and other documents in a locked cabinet. All the data were secured properly in the researcher's password protected laptop. The Windows system in the researcher's Dell laptop was encrypted and the data files were kept hidden. The laptop was in the possession of the researcher at all times, and it was stored in a safe locker when not in use. After the data was analysed, the researcher kept them for a reasonable period of time and then disposed of them so that they did not fall into the wrong hands who might misappropriate them.

Data Analysis and Interpretation

Data analysis and interpretation is the most significant part of the entire study. Creswell (2009) described data analysis as a process of making sense out of the data that involves gathering data, preparing and processing the data for analysis, representing, and moving deeper into understanding the data to make an interpretation of the larger meaning of the data. The researcher analyzed the data collected through the survey method. Data were collected to explore the teachers' practices in planning curriculum using the three stages and the essential components of Understanding by Design. Data was analyzed from the numeric information collected on the measuring instruments. The researcher used descriptive analysis of data for all the variables in the study just to report the findings. The interpretation of data involved addressing the research questions. While doing so, the data were categorized cohesively in the order of the concepts and themes collected from the respondents as their practices and experiences regarding UbD in the elementary classrooms in select school districts in central Minnesota. Subsequently, the categorized themes or concepts were analyzed for the in-depth understandings of the practice.

Chapter Summary

   Chapter 3 presents the research methodology used in this study. The quantitative research approach facilitated the researcher to clarify the research questions and obtain a genuine insight of the participants' understanding, experiences, and practices regarding UbD in the elementary classrooms. The research participants, the instruments, the process and procedures of data collection, and the analysis of data are discussed in this chapter. Chapter 4 presents the results and findings of the study.

Chapter 4: Results

This chapter presents the description of the sample of the study and the reports of the findings. Tables 1 to 3 represent the demographic responses of the participants. Tables 4 through 17 represent research question 1 and 2. Tables 18 through 29 represent research question 3.

Purpose of the Study

The purpose of the study was to examine teachers' planning of curriculum, instruction, and assessment using the essential elements and the three stages of Understanding by Design in the select school districts in central Minnesota. The researcher also intended to investigate to what extent the key principles and the essential elements of UbD are practiced for enduring understanding among elementary students in K-12 public school districts in central Minnesota. The findings of the study will benefit the educators by providing further understanding of the Understanding by Design framework and assist them in identifying the fundamental principles and the essential components of UbD to improve curriculum planning, instruction, and assessment.

Research Questions

The following are the research questions that guided the research study:

1. What elements of the backward design process do curriculum directors in select Minnesota school districts report practicing for enduring understanding among elementary students in their schools?

2. To what extent do curriculum directors report that curriculum related elements are employed in the elementary classrooms in select Minnesota school districts?

3. To what extent are Stages 1, 2, and 3 of Understanding by Design used in the elementary classrooms as reported by the curriculum directors in select Minnesota school districts?

Study Participants

The participants in this study were the curriculum directors from ten school districts in central Minnesota. Utilizing purposive sampling, the researcher selected the participants that had experience working closely with teachers in developing and designing curriculum and have implemented Understanding by Design as a curriculum framework in their schools. Emphasis was given to participants' understandings and experiences regardless of their gender, age, and ethnicity.

The researcher invited and disseminated the survey through an electronic mail to 14 curriculum directors to participate in the study. An email with the brief introduction and the purpose of the study, confidentiality procedure, and the informed consent letter was sent to the prospective participants. Of the 14 curriculum directors who received the invitation to participate, 14 or 100% consented to participate in the study. Out of 14, 12 or 85.7% answered the demographic questions while 4 or 28.6% declined to respond to the rest of the questions.

Tables 1 through 3 represent the demographic responses from the 12 participants. Table 1 represents the size of the school where the respondents served as the curriculum directors. Of the 12 or 100.0% of the respondents, 66.7% reported that their school's enrollment size is more than 3000 students. Eight and three tenths percent of the respondents reported that the school enrollment size is between 2000 to 3000 students 16.7% respondents indicated that the enrollment size of their school is between 1000 to 2000 students whereas another 8.3% revealed that their school's enrollment size is less than 1000 students.

Table 1

School's Enrollment Size of the Responding Curriculum Directors (n = 12)

School Enrollment Size	Frequency	Valid Percentage
Less than 1000 students	1	8.3%
1000-2000 students	2	16.7%
2000-3000 students	1	8.3%
More than 3000 students	8	66.7%
Total	12	100.0%

Curriculum directors are responsible for planning, developing and implementing curriculum, instruction, and assessment that align with the district and state standards. They work closely with teachers and principals in planning and implementing programs for improving students' academic performance. Since a curriculum director's role has a direct impact on student achievement, it is important that curriculum directors are highly educated and have expertise in their profession. Table 2 represents the level of academic degree the responding curriculum directors have acquired. Eighty-three and three tenths percent out of 100.0% respondents reported that they have a specialist degree whereas 16.7% respondents reported to have a doctorate degree as their highest level of academic degree.

Table 2

Highest Academic Degree the Curriculum Directors have Obtained (n = 12)

Academic Degree	Frequency	Valid Percentage
Specialist	10	83.3%
Doctorate	2	16.7%
Total	12	100.0%

Table 3 represents the number of years of experience the respondents have as the curriculum directors. Glatthorn, Jailall, and Jailall (2017) mentioned in the preface of their 4th edition book *The principal as curriculum leader* that "curriculum leadership skills are an essential part of the leadership toolbox to help schools meet annual progress…" (para. 3). Being a curriculum leader is value-laden, so it is essential to know how many years of expertise these respondents have in their area. The table reveals that the entire 100.0% of the respondents have 10 or more years of experience in curriculum leadership roles.

Table 3

Number of Years of Experience the Curriculum Directors have in the Field (n = 12)

Number of years of experience	Frequency	Valid Percentage
10 and more	12	100.0%
Total	12	100.0%

Research Questions 1 and 2

1. What elements of the backward design process do curriculum directors in select Minnesota school districts report practicing for enduring understanding among elementary students in their schools?

2. To what extent do the curriculum directors report that curriculum related elements are employed in the elementary classrooms in select Minnesota school districts?

Table 4 reflects the summary of the aggregate results of the survey items. The table shows the condensed form of data that the researcher found regarding the implementation of the essential elements of UbD and the magnitude of their implementation.

Table 4

Implementation of the Essential Elements of UbD (Research Questions 1 and 2)

Essential Elements of UbD	Fully	Somewhat	Not at all
Use of UbD framework	60%	40%	0%
Content and pedagogy knowledge	70%	30%	0%
Mapping that emphasizes goals	50%	40%	10%
Focus on the core content	70%	30%	0%
Organizing content around the big ideas	70%	30%	0%
Establishment of essential questions	50%	40%	10%
Teaching for deeper understanding	20%	70%	10%
Cornerstone assessments	40%	50%	10%
Construction of assessments	20%	80%	0%
Assessment planning	10%	80%	10%
Instruction that supports constructive learning	60%	40%	0%
Diagnostic assessments	50%	20%	30%
Formative assessments	50%	40%	10%
Analysis and revision of curriculum	40%	60%	0%

Table 5 reflects the responses of the curriculum directors regarding teachers' planning of curriculum, assessment, and instruction using the UbD curriculum framework that targets long term transfer goals and standards recognized in their schools. There is a reduction in the number of participants in the study for some withdrew to participate after responding to the demographic questions. Hence, the total number of participants who responded to the survey questions 4-29 is $n = 10$. Table 5 shows that 60.0% responding curriculum directors rated that their teachers employed the UbD curriculum framework in planning curriculum, assessment, and instruction that targets long term transfer goals and standards recognized in their school. Whereas 40.0%

responding curriculum directors revealed that their teachers employed the UbD curriculum framework moderately in planning curriculum, assessment, and instruction.

Table 5

Use of UbD Framework in Planning Curriculum, Assessment, and Instruction (n = 10)

Responses	Frequency	Valid Percentage
Not at all	0	0%
Somewhat	4	40.0%
Fully	6	60.0%
Total	10	100.0%

In order to establish teachers' pedagogical content knowledge, the responding curriculum directors were asked to rate the teachers if they have adequate knowledge of content and classroom pedagogy. Table 6 indicates that the curriculum directors perceived that 70.0% teachers have adequate knowledge of content and classroom pedagogy whereas 30.0% have modest knowledge of content and classroom pedagogy.

Table 6

Teachers' Knowledge of Content and Classroom Pedagogy (n = 10)

Responses	Frequency	Valid Percentage
Not at all	0	0%
Somewhat	3	30.0%
Fully	7	70.0%
Total	10	100.0%

The responding curriculum directors were asked to rank if the curriculum mapping process in their school districts includes and emphasizes the goals that ensure students achievement. Table 7 reveals that 50.0% of the respondents had fully adopted a curriculum

mapping process that includes and emphasizes the goals that ensure students achievement. While 40.0% reported that they included and emphasized the goals to some extent opposed to the significantly small percentage (10.0%) who did not include or emphasize the goals in their curriculum mapping process.

Table 7

Curriculum Mapping that Emphasizes Goals (n = 10)

Responses	Frequency	Valid Percentage
Not at all	1	10.0%
Somewhat	4	40.0%
Fully	5	50.0%
Total	10	100.0%

In an effort to determine if the curriculum, instruction, and assessment planning in their school districts focused on the core content that aims at students' learning and in-depth understanding, the responding curriculum directors were asked to indicate the amount of focus. Table 8 describes that most of them (70.0%) focused on the core content that aims at students' learning and in-depth understanding in contrast to the 30.0% who focused on the core content that aims at students' learning and in-depth understanding to a moderate extent.

Table 8

Planning that Focuses on the Core Content (n = 10)

Responses	Frequency	Valid Percentage
Not at all	0	0%
Somewhat	3	30.0%
Fully	7	70.0%
Total	10	100.0%

In an attempt to ascertain that the curriculum directors' school districts organized content around the big ideas and frame the content around essential questions that help uncover the content, the respondents were asked to rate the frequency. Table 9 describes that 70.0% of the respondents reported that their school districts organized content around the big ideas and framed the content around essential questions that help uncover the content contrary to the 30.0% respondents who reported that the content were organized in such manner to a small degree.

Table 9

Contents are Organized Around the Big Ideas (n = 10)

Responses	Frequency	Valid Percentage
Not at all	0	0%
Somewhat	3	30.0%
Fully	7	70.0%
Total	10	100.0%

When the curriculum directors were asked to rate the frequency of their teachers' teaching for deeper understanding of key concepts and ideas rather than teaching for recalling of facts and formulas, Table 10 reveals the fact that the majority of respondents' (70%) school districts having teachers teach for deeper understanding of key concepts in some measures. Only a small percentage (20.0%) of respondents showed that their teachers taught for deeper understanding while a significantly lower percentage (10.0%) revealed their teachers did not teach for deep understanding at all.

Table 10

Teaching for Deeper Understanding (n = 10)

Responses	Frequency	Valid Percentage
Not at all	1	10.0%
Somewhat	7	70.0%
Fully	2	20.0%
Total	10	100.0%

Table 11 illustrates the planning of curriculum that focuses on ensuring that the essential questions are established and examined throughout the unit. The majority curriculum directors are 50.0% who reported that they completely affirmed that their curriculum planning focused on the essential questions that were established and examined throughout the unit. Forty percent of the population reported that their curriculum planning focused on the factor to some degree while 10.0% reported that their planning did not focus on establishing essential questions.

Table 11

Establishing Essential Questions (n = 10)

Responses	Frequency	Valid Percentage
Not at all	1	10.0%
Somewhat	4	40.0%
Fully	5	50.0%
Total	10	100.0%

Table 12 summarizes the frequency of responding curriculum directors' district curriculum planning that includes cornerstone assessments to collect information as evidence of students' attainment of goals. Table 12 indicates that 40.0% respondents reported that their curriculum planning significantly included cornerstone assessments whereas 50.0% informed

that their planning fairly included the cornerstone assessments. Contrariwise, the other 10.0% of

the respondents reported that their planning never included the cornerstone assessments.

Table 12

Cornerstone Assessments (n = 10)

Responses	Frequency	Valid Percentage
Not at all	1	10.0%
Somewhat	5	50.0%
Fully	4	40.0%
Total	10	100.0%

Table 13 shows the respondents' planning and constructing assessments that help

students determine when, where, why, and how to use their knowledge in real-life contexts. Only

20.0% respondents informed that they planned and constructed assessments in the fashion that

help students apply their knowledge in real-life situations while the majority of them (80.0%)

reported that construction of assessments in such manner occurred only occasionally.

Table 13

Constructing Assessments that Help Students Apply Their Knowledge (n = 10)

Responses	Frequency	Valid Percentage
Not at all	0	0%
Somewhat	8	80.0%
Fully	2	20.0%
Total	10	100.0%

Results concerning school districts' assessment planning that includes rubrics and/or

performance standards as evaluation tools that help clarify instructional goals are shown in

Table 14. Regarding including rubrics or performance standards, most of the respondents

(80.0%) reported that they moderately included rubrics and/or performance standards in their

assessment planning except the 10.0% who reported that their planning included rubrics and/or

performance standards. At the same time, another 10.0% reported not including rubrics/or

performance standards at all.

Table 14

*Assessment Planning Includes Rubrics and/or Performance Standards as Evaluation Tools
(n = 10)*

Responses	Frequency	Valid Percentage
Not at all	1	10.0%
Somewhat	8	80.0%
Fully	1	10.0%
Total	10	100.0%

Table 15 illustrates the curriculum planning process in the school districts that provides

opportunities to the teachers to exercise instruction that supports constructive learning. When

asked to rate the frequency of opportunities provided to the teachers, 60.0% responding

curriculum directors indicated that they provided opportunities to the teachers to exercise

instruction that support constructive learning to the full extent whereas 40.0% indicated that they

minimally provided opportunities to the teachers to employ instruction that support constructive

learning.

Table 15

Teachers Exercising Instruction that Support Constructive Learning (n = 10)

Responses	Frequency	Valid Percentage
Not at all	0	0%
Somewhat	4	40.0%
Fully	6	60.0%
Total	10	100.0%

The responding curriculum directors were asked to rank if the planning of curriculum and instruction in their school districts includes diagnostic assessments that assist in learning about the strengths and weaknesses of students. Of the total respondents (100.0%), 50.0% reported including diagnostic assessments in their curriculum and instruction planning process in contrast to the 20.0% respondents who indicated that their planning reasonably included diagnostic assessment. However, 30.0% reported that they did not include diagnostic assessment in their curriculum and assessment planning at all.

Table 16

Planning of Curriculum and Instruction Includes Diagnostic Assessment (n = 10)

Responses	Frequency	Valid Percentage
Not at all	3	30.0%
Somewhat	2	20.0%
Fully	5	50.0%
Total	10	100.0%

In an effort to ascertain that the curriculum directors' school districts included formative assessment in their curriculum and instruction planning process for observing students' activities and accumulating information on their understanding, skills, and knowledge; the responding

curriculum directors were asked to rate the occurrence. Table 17 shows that 50.0% respondents

reported including formative assessments in their curriculum and instruction planning process to

the maximum extent. The respondents whose district curriculum and instruction planning process

included formative assessments in some measures are 40.0% compared to the 10.0% of the

respondents who never included formative assessment in their planning.

Table 17

Planning of Curriculum and Instruction Includes Formative Assessments (n = 10)

Responses	Frequency	Valid Percentage
Not at all	1	10.0%
Somewhat	4	40.0%
Fully	5	50.0%
Total	10	100.0%

Table 18 informs the extent of including continuous analysis and revision of curriculum

and instruction in the school districts' planning process for building students' enduring

understanding. Of the total respondents (100.0%), 40.0% indicated that their planning process

abundantly included continuous analysis and revision of the curriculum and instruction in order

to build and increase students' enduring understanding. Nevertheless, 60.0% respondents

reported that their planning process included the continuous analysis and revision of their

curriculum and instruction only to some extent.

Table 18

Continuous Analysis and Revision of the Curriculum and Instruction (n = 10)

Responses	Frequency	Valid Percentage
Not at all	0	0%
Somewhat	6	60.0%
Fully	4	40.0%
Total	10	100.0%

Research Question 3

3. To what extent are Stages 1, 2, and 3 of Understanding by Design used in the elementary classrooms as reported by the curriculum directors in select Minnesota school districts?

Table 19 reflects the summary of the aggregate results of the survey items. The table shows the condensed form of data that the researcher found regarding the implementation of the essential elements of Stage 1, 2, and 3 planning of UbD.

Table 19

Implementation of Stage 1, 2, and 3

Stage 1 elements	Fully	Somewhat	Not at all
Curricular priorities and specific learning goals	60%	30%	10%
Selection of content to align with the goals	70%	20%	10%
Engaging students throughout inquiry of essential questions	60%	40%	0%
Stage 2 elements	Fully	Somewhat	Not at all
Employing six facets of understanding	10%	60%	30%
Demonstrating understanding through the six facets of understanding	10%	70%	20%
Students' understanding and performing	50%	50%	0%
Students self-assess and evaluate their progress	20%	80%	0%
Stage 3 elements	Fully	Somewhat	Not at all
Thoughtful and well-planned instructional approaches	60%	30%	10%
Aligning instructional activities with goals	50%	50%	0%
Using various instructional approaches	50%	50%	0%
Students' understanding of where and why of unit	40%	50%	10%
Students actively construct meaning	40%	60%	0%

When the responding curriculum directors were asked if their school district curriculum planning identifies curricular priorities and specific learning goals, 60.0% of the total population informed that their curriculum planning identified curricular priorities and specific learning goals. The respondents who reported their planning slightly identified curricular priorities and specific learning goals were 30.0% while the rest of the respondents (10.0%) reported that they did not identify the curricular priorities and specific goals at all.

Table 20

Curriculum Planning Identifies Curricular Priorities and Specific Learning Goals (n = 10)

Responses	Frequency	Valid Percentage
Not at all	1	10.0%
Somewhat	3	30.0%
Fully	6	60.0%
Total	10	100.0%

Table 21 represents the result of how the school districts' selection of significant content helps teachers align the curriculum with the targeted goals. Of the total population (100.0%), majority of the respondents (70.0%) indicated that their school districts' selection of content helped teachers align the curriculum with the targeted goals. On the other hand, a small number of respondents (20.0%) reported that selection of content nominally helped teachers to align the curriculum with the targeted goals opposed to the 10.0% respondents who reported that the selection of content did not help teachers to align the curriculum with the targeted goals.

Table 21

Selection of Content to Align with the Curriculum and Targeted Goal (n = 10)

Responses	Frequency	Valid Percentage
Not at all	1	10.0%
Somewhat	2	20.0%
Fully	7	70.0%
Total	10	100.0%

Table 22 reveals if the curriculum directors' curriculum and instruction planning processes of the school districts ensure students are engaged throughout the inquiry of essential questions. When asked to rate the extent, 60.0% respondents indicated that their planning process

completely ensured that the students are engaged throughout the inquiry of essential questions. However, 40.0% indicated that their planning process ensured that their students are engaged throughout the inquiry of essential questions to some extent only.

Table 22

The Planning Ensures Students are Engaged Throughout the Inquiry of Essential Questions (n = 10)

Responses	Frequency	Valid Percentage
Not at all	0	0%
Somewhat	4	40.0%
Fully	6	60.0%
Total	10	100.0%

The six facets of understanding are employed for assessment purposes to collect information as an evidence of students' deeper level of understanding. The responding curriculum directors were asked to rate if their school district curriculum planning uses one or more of the six facets of understanding, i.e., explanation, interpretation, application, perspective, empathy, and self-knowledge as indicators for the assessments to reveal students' understanding. Table 23 reveals that only 10.0% of the respondent reported that their curriculum planning uses one or more of the six facets of understanding. Majority of respondents (60.0%) reported that their planning uses the six facets to some extent while the other 30.0% indicated that their planning never included the six facets of understanding.

Table 23

The Planning of Curriculum, Instruction, and Assessment Employs Six Facets of Understanding (n = 10)

Responses	Frequency	Valid Percentage
Not at all	3	30.0%
Somewhat	6	60.0%
Fully	1	10.0%
Total	10	100.0%

Table 24 reflects the frequency that curriculum directors' school districts give students opportunities to construct meaning and demonstrate understanding using the six facets of understanding. Of the total population, only 10.0% respondents revealed that their school districts gave students opportunities to construct meaning and demonstrate understanding using the six facets of understanding. Majority of respondents (70.0%) indicated their school districts fairly gave students opportunities in contrast to the other respondents (20.0%) whose school districts hardly gave their students any opportunity.

Table 24

Students are Given Opportunities to Demonstrate Understanding Through the Six Facets of Understanding (n = 10)

Responses	Frequency	Valid Percentage
Not at all	2	20.0%
Somewhat	7	70.0%
Fully	1	10.0%
Total	10	100.0%

Table 25 reflects the frequency of the respondents' curriculum planning process that ensures students' understanding of the critical concepts and provides them opportunities to perform with understanding. Of the total population (100.0%), 50.0% indicated that their curriculum planning process ensured students' understanding of the critical concepts and provided them opportunities to perform with understanding. The same percentage out of the total population, i.e., 50.0% of other respondents reported that their curriculum planning process ensured students' understanding of the critical concepts and provided them opportunities to perform with understanding to some extent only.

Table 25

The Planning Ensures Students Understand Critical Concepts and Perform with Understanding (n = 10)

Responses	Frequency	Valid Percentage
Not at all	0	0%
Somewhat	5	50.0%
Fully	5	50.0%
Total	10	100.0%

In an effort to establish if the respondents' school district's curriculum planning process includes opportunities for students to self-assess and evaluate their progress, the respondents were asked to rank the frequency. Table 26 indicates that the majority of respondents (80.0%) reported including opportunities for students to self-assess and evaluate their progress to a modest level. Nevertheless, 20.0% respondents reported that their planning process totally included opportunities for students to self-assess and evaluate their progress.

Table 26

The Planning Includes Opportunities for Students to Self-assess and Evaluate Their Progress (n = 10)

Responses	Frequency	Valid Percentage
Not at all	0	0%
Somewhat	8	80.0%
Fully	2	20.0%
Total	10	100.0%

Results regarding the school districts' curriculum planning that involves thoughtful and well-planned instructional approaches to address the purpose of learning are shown in Table 27. Reporting the frequency of the practice, 60.0% respondents' perceptions indicated that their curriculum planning consisted of thoughtful and well-planned instructional approaches to address the purpose of learning. Meanwhile, 30.0% reported that their planning moderately included thoughtful and well-planned instructional approaches, and 10.0% revealed that their planning did not involve any thoughtful and well-planned instructional approaches.

Table 27

Curriculum Planning Involves Thoughtful and Well-planned Instructional Approaches (n = 10)

Responses	Frequency	Valid Percentage
Not at all	1	10.0%
Somewhat	3	30.0%
Fully	6	60.0%
Total	10	100.0%

In seeking the findings, the respondent curriculum directors were asked if their curriculum planning focuses on aligning instructional activities and learning experiences with the

previously set goals and assessments. Table 28 reports that 50.0% respondents' planning focused

on aligning instructional activities and learning experiences with the previously set goals and

assessments whereas the same percentage, i.e., 50.0% of other respondents indicated that their

planning focused on such alignment to a modest extent.

Table 28

Aligning Instructional Activities and Learning Experiences with Previously Set Goals (n = 10)

Responses	Frequency	Valid Percentage
Not at all	0	0%
Somewhat	5	50.0%
Fully	5	50.0%
Total	10	100.0%

Table 29 illustrates the result of responding curriculum directors' school district

curriculum planning that explores various instructional approaches to interpret students'

understanding and knowledge. Of the total respondents, 50.0% respondents rated that their

planning completely explored various instructional approaches. The other 50.0% respondents

reported that their curriculum planning only occasionally explored different instructional

approaches.

Table 29

Various Instructional Approaches are Explored to Interpret Student Understanding (n = 10)

Responses	Frequency	Valid Percentage
Not at all	0	0%
Somewhat	5	50.0%
Fully	5	50.0%
Total	10	100.0%

The responding curriculum directors were asked to rate if their curriculum planning process ensures students' understanding of "where" and "why" of the unit. Table 30 describes that 40.0% respondents indicated that their planning fully ensured students' understanding of "where" and "why" of the unit. Fifty percent of respondents reported that their planning process moderately ensured students' understanding of "where" and "why" of the unit while the rest of the respondents (10.0%) reported their planning did not have such a factor.

Table 30

The Planning Ensures Students' Understanding of "Where" and "Why" of the Unit (n = 10)

Responses	Frequency	Valid Percentage
Not at all	1	10.0%
Somewhat	5	50.0%
Fully	4	40.0%
Total	10	100.0%

When the responding curriculum directors were asked to rate if their school districts' planning of curriculum and instruction empowers students to actively construct meaning using rethinking, reflection, revision, and transfer understanding, Table 31 reveals that 40.0% respondents reported to have curriculum planning that empowered students to actively construct meaning whereas 60.0% reported that their curriculum planning moderately empowered students to actively construct meaning.

Table 31

Empowering Students to Actively Construct Meaning (n=10)

Responses	Frequency	Valid Percentage
Not at all	0	0%
Somewhat	6	60.0%
Fully	4	40.0%
Total	10	100.0%

Chapter Summary

The study was conducted in 2020 fall to examine curriculum directors' perceptions of teachers' planning of curriculum and instruction using the three stages of backward design and essential elements of UbD in select central Minnesota school districts. Quantitative research methodology was adopted in the study and the online survey instrument was employed to collect data. The survey consisted of three demographic questions, fourteen questions related to research questions 1 and 2, and twelve questions associated with research question 3. Respondents were the curriculum directors from the select school districts in central Minnesota who had been working closely with teachers in planning curriculum, instruction, and assessment. Statistical data were analyzed using SPSS software and the responses were analyzed using frequency distribution. The analysis of the data indicates that the components of Understanding by Design curriculum framework in the select central Minnesota school districts were unevenly executed and there is inconsistency in its implementation.

Chapter 5 examines and summarizes the findings of the study and reviews and verifies the literature with the findings. The chapter also discusses the recommendations for the practice and recommendation for further research.

Chapter 5: Discussion, Conclusions, Limitations, and Recommendations

The research study was carried out to explore through the perceptions of curriculum directors teachers' planning and practices using the essential components and the three stages of UbD for successful teaching and learning in the select public school districts in central Minnesota. The chapter addressed the discussion and the findings of the study from the viewpoint of the literature. Moreover, the summary of the findings and the recommendations for future practice are also included. The chapter concluded with the limitations, and the recommendations for future research.

The best-practice curriculum, as stated by McTighe and Wiggins (2005), is one that specifies what students should accomplish before they move to the next level, and what teachers and students are required to do in order to achieve the desired goal. In a standard-dominated education system, rather than just delivering the curriculum (Tomlinson & McTighe, 2006), teachers must unpack and translate the content standard into a teachable curriculum and construct appropriate instruction and assessment in order to pursue the targeted outcomes (McTighe & Wiggins, 2012b). Curriculum directors and teachers are required to develop, design, and implement such curricula that support students to actively uncover facts, contemplate concepts, and construct meaningful ideas. While the literature suggests the importance of Understanding by Design as a framework that helps educators in promoting understanding-based learning outcomes, very limited, if any information, could be found that explains the effective or successful implementation of Understanding by Design as a curriculum framework in K-12 public school settings.

The purpose of this quantitative study was to examine teachers' planning of curriculum, instruction, and assessment using the essential elements and the three stages of Understanding by

Design in select Minnesota school districts. The researcher also intended to investigate to what

extent the key principles and the essential elements of UbD were practiced for enduring

understanding among elementary students in K-12 public schools in central Minnesota. The

findings of the study will benefit the educators by providing further understanding of the

Understanding by Design framework and assist them in identifying the fundamental principles

and the essential components of UbD to improve curriculum planning, instruction, and

assessment.

  The following are the research questions that guided the research study:

1. What elements of the backward design process do curriculum directors in select

  Minnesota school districts report practicing for enduring understanding among

  elementary students in their schools?

2. To what extent do the curriculum directors report that curriculum related elements are

  employed in the elementary classrooms in select Minnesota school districts?

3. To what extent are Stages 1, 2, and 3 of Understanding by Design used in the

  elementary classrooms as reported by the curriculum directors in select Minnesota

  school districts?

  The first and second research questions were related to the essential components of

Understanding by Design as a backward design curriculum framework. The proponents of

Understanding by Design recommend educators employ the key components of UbD as the

components enhance their curriculum and instructional designing process that promotes higher

levels of students' achievement (Brown, 2004). The research questions were asked to determine

what essential components are used, and to what extent they are used to develop enduring

understanding among elementary students in their schools.

The third research question was related to the key principles of Understanding by Design's three stages of curriculum planning: identifying the targeted learning goals, considering assessing prior to instructional activities for collecting evidence of student understanding, and designing learning activities that help achieve the desired goals.

Chapter 5 presents a discussion of the major findings as related to the literature on backward design curriculum, Understanding by Design, its key principles and essential components that educators need to include in their curriculum designing for students' enduring understanding and transfer of knowledge in real-world contexts. The chapter concludes with the discussion and the limitation of the study, recommendations for future practice, recommendations for future research, and a brief summary.

Discussion

The researcher intended to determine whether the key components of UbD are employed, and if employed, to what extent they are employed by the teachers and curriculum directors in the public-school districts in central Minnesota. The study participants were 12 curriculum directors, of which two declined to respond to the research questions after they responded to the demographic questions. The curriculum directors were working in the school districts where the enrollment sizes ranged from less than 1000 students to more than 3000 students. The curriculum directors had either a specialist degree or a doctorate degree as their highest level of degree. Eighty-three percent out of 100.0% responding curriculum directors reported that they had a specialist degree whereas 16.7% reported to have a doctorate degree. All the responding curriculum directors had 10 or more years of experience in curriculum leadership roles.

Research Question 1

Understanding by Design (UbD) provides educators a framework that assists them to design a curriculum that promotes understanding-based learning outcomes, to develop an array of assessment tools to collect relevant information on student performance, and to construct varieties of instructional activities to stimulate students' deeper level of understanding. While it is essential to employ the principles and the key components of UbD to achieve the desired outcomes, the findings in this study revealed that 60.0% of responding curriculum directors specified that their teachers employed the UbD curriculum framework in planning curriculum, assessment, and instruction that targets long term transfer goals and standards recognized in their school whereas 40.0% revealed that their teachers employed the UbD curriculum framework moderately in planning curriculum, assessment, and instruction.

Likewise, the essential elements that UbD proposes educators to implement in their schools are: content and pedagogy knowledge, curriculum mapping that emphasizes goals, selection of core content, organizing content around the big ideas, framing essential questions, teaching for understanding, utilizing cornerstone assessments to collect evidence of student understanding, constructing assessments to help students transfer their knowledge, using rubrics as evaluation tools, crafting instructions that support constructive learning, employing diagnostic and formative assessments, and continually analyzing and revising curriculum and instructions. The curriculum directors were asked if the essential elements of UbD were employed in their school districts to promote enduring understanding and learning. The majority of the curriculum directors reported that their planning process incorporated all the essential elements of UbD. However, 10% of the curriculum directors indicated that their curriculum planning process never included elements such as curriculum mapping to identify and emphasize the overarching goals,

establishment of essential questions, teaching for deep understanding, cornerstone assessments, formative assessments, and rubrics or performance standards in their assessment planning. At the same time, 30% of the respondents indicated that their planning never included diagnostic assessments to identify the strengths and weaknesses of their students and plan effectively.

Research Question 2

Research question 2 aimed at exploring the magnitude of the application of the curriculum related essential elements in the elementary classrooms as reported by the curriculum directors in select Minnesota public school districts. It is noticeable that there were a predominant number of curriculum directors who reported that their planning encompassed essential components of UbD such as content and classroom pedagogy knowledge, focus on the core content and big ideas, constructive learning, curriculum mapping, essential questions and diagnostic and formative assessment in entirety. However, there were also an insignificant number of participants who reported that their planning included elements such as teaching for deeper understanding, cornerstone assessments, rubrics, constructing assessments that help students apply their knowledge including continuous analysis and revision of the curriculum and instruction. While 10% of the curriculum directors reported that they never included essential elements of UbD in their planning, particularly curriculum mapping, teaching for deeper understanding, essential questions, assessments such as cornerstone assessments, diagnostic and formative assessments, and rubrics as evaluation tools.

Content and Pedagogy Knowledge

An effective and successful classroom requires a teacher who knows what to teach and how to teach. A teacher with abundant content knowledge can impart the students with knowledge about facts but is inefficacious to support students for a deeper level of understanding

if she lacks pedagogical knowledge. The responding curriculum directors stated that 70.0%

teachers have adequate knowledge of content and classroom pedagogy whereas 30.0% have

modest knowledge of content and classroom pedagogy. Kelting-Gibson (2005) was in the view

that along with the knowledge of resources, instructional goals, instructional planning, and

appropriate assessment for students, it is essential that teachers have knowledge of content and

pedagogy. Since educators are required to translate and unpack content standards into teachable

curriculum and clarify the desired results and develop appropriate assessments and instruction

(McTighe & Wiggins, 2012b), teachers must have ample content and general pedagogical

knowledge for designing curriculum, instruction, and assessment (Graff, 2011).

Mapping that Emphasizes Goals

In order for the teachers to improve student learning and achievement, standards should

be interpreted into best classroom practices. While allowing teachers to be actively involved in

designing curriculum that aligns with the standards, it is essential that the school districts have a

curriculum map that allows teachers to compare their curriculum to the district and state

standards as well as other teachers' curriculum who teach the same subject and the grade (Burns,

2001). Curriculum mapping ensures educators identify the overarching goals, organize scope and

sequence, and guides them throughout the instructional process while supporting students in

developing skills and knowledge at their various growth levels (Wiggins & McTighe, 2012).

The responding curriculum directors revealed that 50.0% of the respondents' school

districts had fully adopted a curriculum mapping process that included and emphasized the goals

that ensure students achievement. While 40.0% reported that they included and emphasized the

goals to some extent opposed to the significantly small percentage (10.0%) who did not include

or emphasize the goals in their curriculum mapping process. McTighe and Wiggins

recommended teacher educators apply backward mapping while creating a coherent curriculum. They assured that backward mapping helps educators identify and address gaps or redundancies in the curriculum, with the aim of revisions and additions in the curriculum (Wiggins & McTighe, 2005). Also, curriculum mapping is a process that allows educators to examine if the components of a curriculum align with the standards and refine and adjust the curriculum if they do not align (Kopera-Frye et al., 2008). Along with the curriculum alignment, alignment of assessment is also necessary in curriculum mapping. Alignment of assessment begins with the unit level planning ahead of developing lessons and activities as it helps teachers align the planning process to learning targets and students' progress at the final assessment (Gregory & Kuzmich, 2011). They further established that this kind of planning process ensures what is taught matches with the academic expectations identified in the learning standards (Gregory & Kuzmich, 2011).

Focus on the Core Content

Identifying and making the selection of significant content enables teachers to align the curriculum with the targeted goal which is crucial for learners' understanding and transferring of knowledge (Wiggins & McTighe, 2012). A teacher's knowledge of both the subject and the students is one of the most crucial factors in determining content (Tomlinson & Strickland, 2005). The respondents described that most of them (70.0%) focused on the core content that aims at students' learning and in-depth understanding while 30.0% insignificantly focused on the core content that aims at students' learning and in-depth understanding. It is necessary that educators select and adjust content and design activities that trigger and stimulate learners' interest that leads to understanding and actual learning.

The emphasis of a selection of content that aims at students' learning and in-depth understanding is consistent with what is in the literature. Because if learners have to keep working on the same content they have already mastered, no significant learning can occur; and if the content is far higher than the learners' mastery level, confusion and frustration will occur but not learning (Tomlinson, 2001). Choice of content and activities that are connected to learners' familiar context promote thought and exploration (Darling-Hammond et al., 2019). The authors reflected that if content and activities are pertinent to the students' lives or the life events they have experienced or take interest in, if they emphasize genuine and thought-provoking problems, convince students that these activities are important, and if students are provided more choices of topics and activities, students can make a connection to their interest and teaching and learning will be more meaningful (Darling-Hammond et al., 2019).

Organizing Content around the Big Ideas

Because a big idea is a core concept, a theory or a theme, a lens to look at things at a deeper level, and a powerful tool that enables learners to make sense of discrete facts and unfamiliar ideas (Wiggins & McTighe, 2005), identifying and framing big ideas is essential as it allows teachers to teach for deeper understanding and transfer. Covering a large chunk of content or a large number of facts on a topic is never preferable because the information learners receive from the content coverage is always superficial. Big ideas help manage the load of information and make discrete knowledge transferable by allowing learners to inquire, discover, and uncover the ideas by making meaning of the content (McTighe, Seif, & Wiggins, 2004).

Seventy percent of the respondents reported that their school districts organized content around the big ideas and framed the content around essential questions that help uncover the content contrary to the 30.0% respondents who reported that the content were organized in such

manner to a small degree. It is evident in the result of the study as compared to existing literature that teachers identified the big ideas that they want their students to understand and dig deep into the content to uncover the core of the subject (Wiggins & McTighe, 2005). The result also indicated that the teachers organized big ideas because they make facts more understandable, make unfamiliar ideas more familiar, and offer the foundation for transfer of knowledge (Wiggins & McTighe, 2005).

Establishment of Essential Questions

Recognizing the significance of a big idea and framing a question from it turns into an essential question (Wiggins, 2010). Along with the big ideas, essential questions offer a base to explore the key ideas of the content. Half of the curriculum directors (50.0%) reported that they completely affirmed that their curriculum planning focused on the essential questions that are established and examined throughout the unit. Forty percent of the population reported that their curriculum planning focused on the factor to some degree while 10.0% reported that their planning did not focus on establishing essential questions. The result of this study aligns with the literature when the majority of the respondents asserted that their curriculum planning focused on framing the essential questions. McTighe and Thomas (2003) confirmed that big ideas and essential questions provide a conceptual lens that support teachers to focus on the specific content, promote meaningful learning experiences, and afford opportunities to manage large quantities of content knowledge. They further reasoned that it is necessary for educators to develop essential questions as it prepares learners to understand the core content, equips them for a meaningful performance with the content and transfer their learning (McTighe & Thomas, 2003).

Teaching for Deeper Understanding

The literature emphasized that teaching for understanding demands a shift from traditional content coverage approach to an uncovering approach of transferable ideas and processes (McTighe & Seif, 2011). Contrary to teaching and testing to examine students' knowledge on facts, teaching for understanding is more than knowing facts as it comprises more sophisticated instruction and assessment (Wiggins & McTighe, 2011). For the purpose of helping students develop a critical mindset, teaching for understanding is a must because it allows students to think comprehensively, look at problems from different perspectives, and process creatively to find multiple solutions (NBPTS, 2016).

In contrast to the literature, when the responding curriculum directors were asked if their teachers teach for deeper understanding of key concepts and ideas rather than teaching for recalling of facts and formulas, the majority of respondents' (70%) reported that teachers in their school districts taught for deeper understanding of key concepts fairly in some measures. Only a small percentage (20.0%) of respondents showed that their teachers taught for deeper understanding while a significantly lower percentage (10.0%) revealed their teachers did not teach for deep understanding at all. The findings in this study indicates the conviction of educators toward teaching for deeper understanding. Many educators believe that the best way to meet the state standards and raise test scores is to cover the content and make students practice the test format. They take the view that teaching and assessing for understanding are not compatible with high-stakes accountability tests (McTighe, & Wiggins, 2012). Furthermore, many educators perceived that "there is no time for or need to engage in in-depth instruction that focuses on developing and deepening students' understanding of big ideas" (McTighe & Wiggins, 2012b, p. 8).

Teaching to the test that focuses on memorization and recall that students cannot correlate to their understanding and experience, have been the evidence of futile instruction that have neither given teachers satisfaction nor benefitted the learners in the long term. This may help students learn superficial content knowledge but will actually impede developing and understanding of core ideas of the taught content (McTighe, & Wiggins, 2012a). While teaching for understanding is an intellectual undertaking, a rich and creative process that equips students with essential skills to apply their knowledge in an unfamiliar situation and advance their understanding for more exploration (NBPTS, 2016).

Cornerstone Assessments

Teaching for understanding involves the combination of thoughtful selection of content, designing appropriate instructional activities and authentic assessment. The literature suggests that it is necessary that teachers know what information they are going to collect as the evidence of attainment of goals. Since the evidence reflects the desired goals, it is essential for educators to think in advance what evidence they are going to collect and document so as to validate if the targeted goals have been attained (Wiggins & McTighe, 2005).

The result in this study indicates that 40.0% of the respondents' curriculum planning significantly includes cornerstone assessments to collect information as evidence of students' attainment of goals whereas 50.0% informed that their planning fairly includes the cornerstone assessments. Contrariwise, the other 10.0% of the respondents reported that their planning never includes the cornerstone assessments. The respondents in the study did not project to have employed authentic and contextualized assessments that reflect the authentic performance of the learners (National Research Council, 2002). In spite of identifying the big ideas, if teachers use

such assessments that only measure students' discrete knowledge and skills, it is not possible to determine if students have truly understood the core concept (National Research Council, 2002).

To observe the students' progress towards the desired outcomes, it is necessary that teachers incorporate assessment protocols such as, tests and quizzes with performance-based items, reflective assessments such as journals, logs, listen-think-pair-share activities, interviews, self-evaluation activities, and peer response groups, academic prompts that clearly specify performance task elements, and culminating assessment projects that allow for student choice and independent application (Brown, 2004). The aforementioned assessments provide teachers with abundant information about the students' effort and progress on learning and understanding of the core concept as they are also involved with the teachers for the accomplishment of their goals (Brown, 2004). Moreover, assessments designed for high scoring do not help teachers improve their instruction, but assessments which are authentic and are administered on a regular basis, from which teachers can receive immediate results to analyze individual student-level data and plan and implement appropriate instruction increase students' opportunities to learn (Guskey, 2003).

Construction of Assessments

The literature suggests that assessment is an integral part of an instructional process; it should be ongoing and should emphasize the daily interactions between a teacher and students, provide opportunities for students to reflect on their understanding so that the classroom data collected on the regular basis should be used to improve teaching and learning (Guskey, 2003; National Research Council, 2001). These opportunities enable teachers with the evidence to identify where or what the problems are and make adjustments and improvements in the lessons (National Research Council, 2001). Moreover, assessments that are constructed with the focus on

the concepts and skills emphasized in the classroom and that align with the targeted objectives and state standards improves classroom instruction and students learning (Guskey, 2003). Backward design of curriculum planning calls for thinking and designing assessment before developing any instructional activity. The assessment designed before deciding what instructional activities are going to be used in the classroom guides teachers to focus on the essential content and refine their instruction because such assessments clarify what teachers want their students to understand and be able to do. (Wiggins & McTighe, 2005).

The respondents were asked if their school district's planning and constructing assessments help students determine when, where, why, and how to use their knowledge in real-world contexts. Only 20.0% respondents informed that they planned and constructed assessments in the fashion that help students apply their knowledge in real-life situations while the majority of them (80.0%) reported that construction of assessments in such manner occurred only occasionally. The large number of participants responding that their teachers construct assessments that allow their students to actively uncover facts, ponder ideas, and construct reasonable thoughts is relatively low which is inconsistent with the literature. If teachers want their students to demonstrate understanding by processing their depth of knowledge in various new situations, it is necessary for the teachers to craft thought-provoking assessments that challenge students to think critically, creatively, and explore new ideas. Wiggins and McTighe (2005) agreed with the idea of constructing assessments to induce transferability that demand students apply what they have learned wisely, flexibly, and creatively in various unfamiliar situations.

Clear and transparent assessments enable students to have an explicit view of their endeavor and help them identify what it means to complete it successfully (Black et al., 2004).

Similarly, understanding a concept implies that students can think from different points of views and creatively find a solution to solve the problem. Therefore, in order to collect the evidence of understanding, it is necessary that teachers use quality assessments that allow students to extract understandings of the core concept and apply them in unintended contextual situations rather than just recalling the facts and formulas in the textbooks (Wiggins & McTighe, 2005).

Assessment Planning

A rubric is a performance indicator that provides teachers with the framework for observing and assessing students' performances (Brookhart, 2013; Wiggins & McTighe, 2005). Similarly, a performance standard is set of the rules or guidelines and the description that helps teachers what to expect when judging the quality of students' responses and performances (Arter & McTighe, 2001). Whatever it be, a rubric or a performance standard, they contain the description of assessment criteria, structure of different standards of performance, and the description of what success appears to be on different levels (Wiggins & McTighe, 2005).

Only a small percentage (10.0%) reported that their planning fully included rubrics and/or performance standards. A large number of respondents (80.0%) reported that they moderately included rubrics and/or performance standards in their assessment planning. At the same time, another 10.0% reported no inclusion of rubrics/or performance standards. The result illustrates that the teachers' practice of including rubrics in their planning was not coherent with the literature. The literature implies that if a teacher wants to observe how accurately and adequately students are performing, rubrics offer the criteria to judge with the description of performance and with the opportunity to use them for feedback, and later instruction (Brookhart, 2013). McTighe and Seif (2011) also considered the criteria in a rubric as a tool that teachers can use to provide students feedback for their strengths and weaknesses. Teachers are advised to

offer the rubric to students before assessing the students so that they can view the performance target and reflect on the qualities of their work (Brookhart, 2013; McTighe and Seif, 2011). Also, for measuring the level of understanding, teachers are recommended to construct a rubric using the six facets of understanding (Wiggins & McTighe, 2005). As such rubrics enable teachers to score students' performances more fairly, and guide students for their assessments as students can clearly identify the standards for their performance (Wiggins & McTighe, 2007).

Instruction that Supports Constructive Learning

In a constructivist teaching and learning practice, professional judgement and teacher autonomy is encouraged. Teachers are given power to make adjustments, tailor instruction, and facilitate students to understand the key ideas and transfer their understandings by making meanings of important ideas and activities from their own experiences (McTighe & Wiggins, 2012b). Teachers who exercise instruction that support constructive learning seek and value student's prior knowledge about the concept, their interest and needs, and adjust instruction according to the different needs and interests; structure lessons that challenge students to construct new knowledge with the help of prior knowledge; construct lessons that are relevant to students' experiences rather than creating isolated lessons; design lessons around big ideas and essential questions; and assess students' knowledge on the daily basis (Wiggins & McTighe, 2007).

When the responding curriculum directors were asked to rate the frequency of opportunities provided to the teachers, 60.0% indicated that they provided opportunities to the teachers to exercise instruction that support constructive learning to the full extent whereas 40.0% indicated that they minimally provided opportunities to the teachers to employ instruction that support constructive learning. When comparing the result to the literature, uniformity exists

to a considerable degree that teachers in the study were constructivist teachers who were given

opportunities to promote constructivist teaching and learning as reported by the curriculum

directors. Since constructivist teachers understand that learners learn from others and construct

new knowledge with the help of their prior knowledge, experiences and understandings which

are framed within themselves as raw materials, they encourage students to take part in every

activity eagerly so that they can question themselves and build understanding and become a

skilled learner (Glasersfeld, 2005). Teachers are required to construct instructions that enable

students to involve in activities that are contingent to their understanding and should be able to

know the purpose of the activities and the goal that they will be achieving at the end

(Glasersfeld, 2005). Wiggins and McTighe (2005) agreed that curriculum planning processes

should involve teachers to design instructions that enable learners to construct or reconstruct

knowledge based on their pre-existing knowledge as the creative subjective response to certain

factors. Because such practices help engage students in learning experiences and improve

achievement (Glasersfeld, 2005).

Diagnostic Assessments

Diagnostic assessments support teachers to identify the strengths and weaknesses of

students and plan effective units and instruction according to the different student abilities.

Diagnostic assessments enable teachers to seek constructive and authentic approaches to

instruction that assess and improve students' different abilities and that results as an outcome-

based education (Wiggins & McTighe, 2007).

Of the total respondents, 50.0% reported that included diagnostic assessments in their

curriculum and instruction planning process in contrast to the 20.0% respondents who indicated

that their planning reasonably included diagnostic assessment. However, 30.0% reported that

they did not include diagnostic assessment in their curriculum and assessment planning at all. The result in this study does not align with the literature that implies that it is critically important to diagnose students' strengths and limitations in advance and take remedial actions to nurture the students' learning. Diagnosing a student's existing level of capability to generate meaningful intervention is extremely crucial (Pham, 2012), and this can be done through diagnostic assessments (Tomlinson & McTighe, 2006). They further pointed out that diagnosing what students lack and providing feedback is the crucial aspect of instruction because this process assists students in carrying out meaningful activities to improve their understanding and skills and allow them to verify what they have mastered over and what they need to improve (Tomlinson & McTighe, 2006).

Formative Assessments

Formative assessments are an effective approach to guide teaching and learning and shape students' knowledge and skills. It is the process of observing numerous tasks performed by the students and accumulating information on their understanding, knowledge, skills, and behavior for their future improvements (Wiggins & McTighe, 2005). Formative assessment is ongoing and employed during the instruction to see where the students are and how they are developing (Brookhart, 2013). The result shows that 50.0% respondents reported to have included formative assessments in their curriculum and instruction planning process for observing students' activities and accumulating information on their understanding, skills, and knowledge to the maximum extent. The respondents whose district curriculum and instruction planning process included formative assessments in some measures are 40.0% compared to the 10.0% of the respondents who never included formative assessment in their planning. It confirms that there is no correspondence between the result of this study and the literature. The result

demonstrates that in 50% of respondents' school districts students' daily activities are not observed, monitored, and evaluated continuously by their teachers over most of the duration of their teaching learning.

The literature assures that formative assessments help teachers to clarify the purpose of assessment to the students. Clarification of the assessment process helps them to be aware of what they should regard important in learning, how they spend time, and how they come to see themselves as students (Mikre, 2010). Formative assessment has proved to be an efficient, on-going process that collects analyses and interprets the information students' skills on language learning (Briggs et al., 2008). It is an endless process of measuring and assessing students' abilities and skills and assisting them to identify their problems on their own and improve their learning. Because motivation and achievement increase when teachers practice formative assessments and involve students to participate actively to focus on their goals, create ideas, and construct knowledge (Brookhart, 2013).

Analysis and Revision of Curriculum

The best-practice curriculum is the one that specifies what students should accomplish before they move to the next level, and what teachers and students are required to do in order to achieve the desired goal (Wiggins & McTighe, 2005). The key purpose of effective classroom practice is to support student success by ensuring their learning, understanding, and skills. This implies that a teacher in an effective classroom constantly orchestrates and addresses the quality of both curriculum, assessment, and instruction to ensure it can support and allow each individual student to engage in meaningful tasks and understand and apply the concepts in an authentic context (Tomlinson & McTighe, 2006). They further explained that a key part of a teacher's job is to perform an ongoing action research for continuous improvement of student

learning. Moreover, regular reviews of curriculum and assessment designs, based on design standards, are needed for quality control and to avoid the most common design mistakes and disappointing results (McTighe & Seif, 2011). Student and school performance gains are achieved only through regular reviews of results followed by targeted adjustments to curriculum and instruction (McTighe & Seif, 2011).

The first stage of Understanding by Design allows educators to review the existing curriculum and the district standards. Wiggins and McTighe (2005) viewed it necessary for teacher educators in identifying curricular priorities starting with the content standard and finding the specific learning goals and their possible applicability in the real world. In their opinion, identifying the significance of the lesson enables teachers to align the curriculum with the targeted goal by making the selection of content crucial for learners' understanding and transferring of knowledge (Wiggins & McTighe, 2005). When the responding curriculum directors were asked if they incorporated continuous analysis and revision of the curriculum and instruction in their planning, of the total respondents, 40.0% indicated that their planning process abundantly included continuous analysis and revision of the curriculum and instruction in order to build and increase students' enduring understanding. Nevertheless, 60.0% respondents reported that their planning process included the continuous analysis and revision of their curriculum and instruction only to some extent. These results indicate that the teachers' practice of continuous analysis and revision of curriculum and instruction is not coherent with the literature. The literature suggests that the application of backward design involves constant analysis and revision of the courses that help build enduring understanding in students (Wiggins & McTighe, 2007). The authors proposed that a quality curriculum is recursive and requires revision and reconsideration of the crucial elements continuously until the purpose is entirely

understood. They also emphasized that the continuous revision, reconsideration, and analysis of the elements enable educators to align the instruction and assessment with the curriculum to attain desired outcomes (Wiggins & McTighe, 2007).

Research Question 3

Research question 3 aimed at finding out to what extent Stages 1, 2, and 3 of Understanding by Design were used in the elementary classrooms as reported by the curriculum directors in select Minnesota public school districts. The findings of this study suggested that the majority of curriculum directors implemented the Stage 1 components of UbD in their curriculum and instruction planning. However, there was a small percentage of curriculum directors who reported that their planning insignificantly adopted Stage 1 components. Similarly, incorporating the Stage 2 elements in their curriculum design appeared to be inadequate as the results indicated. Moreover, 50% of the respondents indicated that their planning never included components such as six facets of understanding. The components essential for Stage 3 planning was also reported to be sporadically implemented by the majority of the teachers as reported by the curriculum directors. Nevertheless, there was a similar percentage of respondents who reported to employ Stage 3 elements in their planning to the maximum extent.

Planning Stage 1

Planning Stage 1 using the UbD framework requires teachers to ponder essential factors such as identifying big ideas, framing essential questions, making meaning of a concept, and transfer of knowledge, along with the mandated standard goals. Understanding a new idea or a concept results from making inferences, deriving new insight, and connecting new ideas with the prior knowledge and experiences (Wiggins & McTighe, 2011). Understanding an idea, and activation and application of previous knowledge involves an active meaning-making process.

The meaning-making process involves digging deeper to make sense of the idea, pursue essential questions, draw inferences, and reflect and analyze the idea resulting in transfer of knowledge into new situations (Wiggins & McTighe, 2011). UbD upholds that understanding and transferring of knowledge and skills rest upon teachers' and curriculum leaders' ability to identify curricular priorities and specific learning goals. When the responding curriculum directors were asked if their school district curriculum planning identifies curricular priorities and specific learning goals, 60.0% of the total population informed that their curriculum planning identified curricular priorities and specific learning goals. The respondents who reported their planning slightly identified curricular priorities and specific learning goals were 30.0% while the rest of the respondents (10.0%) reported that they did not identify the curricular priorities and specific goals at all. Likewise, the respondents were inquired if their school districts' selection of significant content helps teachers align the curriculum with the targeted goals. Of the total population, the majority of the respondents (70.0%) indicated that their school districts' selection of content helped teachers align the curriculum with the targeted goals. On the other hand, a small number of respondents (20.0%) reported that their selection of content nominally helped teachers to align the curriculum with the targeted goals opposed to the 10.0% respondents who reported that the selection of content helped teachers by no means. The responding curriculum directors were also asked if their school district's curriculum and instruction planning process ensured that students were engaged throughout the inquiry of essential questions. When asked to rate the extent, 60.0% respondents indicated that their planning process completely ensured that the students were engaged throughout the inquiry of essential questions. However, 40.0% indicated that their planning process ensured that their students were engaged throughout the inquiry of essential questions to some extent only.

The result of the study was cohesive to what the literature recommends about designing the curriculum using the crucial elements of Stage 1 of the UbD framework. When designing a curriculum for understanding, teachers must unpack the standards, and identify curricular priorities and specific learning goals (Brown, 2004). Identifying these aspects enables teachers to align the curriculum with the targeted goal by making the selection of content crucial for learners' understanding and transferring of knowledge (Wiggins & McTighe, 2005). The selection of content and designing backward is the means to an intellectual end which learners will take away and apply in the long run (Wiggins & McTighe, 2011). Similarly, along with big ideas, Stage 1 calls for establishing the essential questions. In this stage, teachers are required to determine the key ideas they want their students to understand and frame those understandings on the basis of essential questions (Wiggins & McTighe, 2005). Teachers who promote learning for understanding make sure that their students are engaged throughout the inquiry of essential questions. It is therefore critical to identify essential questions that are open-ended, thought provoking, generative, that evoke further inquiries, that demand higher-order thinking, that are intellectually engaging, and that are explored over time (McTighe & Wiggins 2012a).

Planning Stage 2

Planning Stage 2 allows teachers and curriculum leaders to think about assessing students' genuine understanding. Assessing understanding is more challenging as it constitutes an analysis of how teachers can gather evidence of their students' acute understanding, their meaning-making of new ideas, and their ability to transfer their authentic understanding in an unfamiliar situation (Wiggins & McTighe, 2005). To assess students' understanding and to foster continuous development, teachers use a variety of formal and informal assessments, for instance, tests and quizzes with constructed response items, reflective assessments, performance-based

assignments, and independent project-based culminating work (Brown, 2004). When designing

assessments for understanding, evidence that teachers want to gather needs to be anchored in

authentic performance tasks that allow students to perform a real problem in a real-world

situation for a real or simulated audience (Wiggins & McTighe, 2005). Similarly, to determine

students' understanding and measure their performance, teachers are recommended to use six

facets of understanding through which students can demonstrate their true understanding. The six

facets of understanding (explanation, interpretation, application, perspective, empathy, and self-

knowledge) serve as indicators or frames for the different types of assessment teachers use to

reveal understanding as transfer (Wiggins & McTighe, 2011).

When the responding curriculum directors were asked to rate if their school district

curriculum planning used one or more of the six facets of understanding as indicators for the

assessments to reveal students' understanding, only 10.0% of the respondent reported that their

curriculum planning used one or more of the six facets of understanding. Majority of respondents

(60.0%) reported that their planning used the six facets to some extent while the other 30.0%

indicated that their planning never included the six facets of understanding. Similarly, when they

were asked to rate the frequency their teachers in their school districts gave students

opportunities to construct meaning and demonstrate understanding using the six facets of

understanding, only 10.0% respondents revealed that their school districts gave students

opportunities to construct meaning and demonstrate understanding using the six facets of

understanding. Majority of respondents (70.0%) indicated their school districts fairly gave

students opportunities in contrast to the other respondents (20.0%) whose school districts hardly

gave their students any opportunity. Nevertheless, 50.0% indicated that their curriculum planning

process ensured students' understanding of the critical concepts and provided them opportunities

to perform with understanding. The same percentage out of the total population, i.e., 50.0% of other respondents reported that their curriculum planning process ensured students' understanding of the critical concepts and provided them opportunities to perform with understanding to some extent only. At the same time, the majority of respondents (80.0%) reported that their planning included opportunities for students to self-assess and evaluate their progress to a modest level. Nevertheless, 20.0% respondents reported that their planning process totally included opportunities for students to self-assess and evaluate their progress. The result of this study revealed that the teachers' use of the crucial elements in Stage 2 curriculum planning was not coherent to the literature. UbD advocates that the framework works as a guide or a tool and it requires to integrate all the essential components in curriculum, assessment, and instruction planning.

The six facets of understanding are the guidelines and framing tools that help validate students' understanding, however, it is not necessary that teachers use all the six facets when assessing students' understanding (McTighe & Wiggins, 2012b). Any of the six facets determine the level of understanding teachers need as valid measures of understanding. And the in-depth understanding of the learning encompasses all the six levels which students can demonstrate as progressive learners at the end of the grade level and even after their graduation from school (Wiggins and McTighe, 2005). In addition to addressing student understanding, the six facets also provide a helpful scaffold in sparking provocative questions and transferring performance (Wiggins and McTighe, 2005). Since UbD advocates the use of multiple assessment tools to enhance assessment of understanding, including assessments that allow students for self-reflection and self-assessment improve learning (Brown, 2004). This process demands students to reflect on their activities, make judgments, and reveal their thinking (Wiggins & McTighe,

2005) with the help of reflective journals, peer review, think logs, and listen-think-pair-share

activities (Brown, 2004). Because self-assessment is the most important part of monitoring

student progress (Brown, 2004), in this course of assessment, students primarily focus on their

own performance, identify their strengths and weaknesses, and look for the areas for

improvement.

Planning Stage 3

Planning Stage 3 demands teachers and curriculum leaders to contemplate on factors such

as ensuring students recognize the learning goals, purpose of learning, and performance

requirements; hooking students to dig deeper into the big ideas; providing abundant opportunities

to explore big ideas; equipping them with quality instruction for authentic performance; and

offering them opportunities for rethink, reflect, revise, and refine their work. (Wiggins &

McTighe, 2005). Before designing instructional activities for developing in-depth understanding

of the key ideas, UbD calls for determining desired learning goals and assessment. While

crafting instructional activities for understanding, teachers must be clear about the specific

understanding desired and what it looks like in actuality (Wiggins & McTighe, 2011). They

added that teachers are required to be clear about what systematic tools and instructional

approaches are needed to employ to achieve the expected goal. This stage allows teachers to plan

instructional activities that provide students with abundant opportunities to develop and deepen

their understanding of the key ideas and align learning experiences and instructions with

previously set goals and assessments. (Wiggins & McTighe, 2005). With the goal in mind,

teachers in this stage enable students to uncover the enduring ideas by engaging them in

constructing meaning and attain the desired knowledge, skill, and understanding (Tomlinson &

McTighe, 2006).

Reporting the frequency of the practice that involves thoughtful and well-planned instructional approaches to address the purpose of learning, 60.0% respondents indicated that their curriculum planning consisted of thoughtful and well-planned instructional approaches to address the purpose of learning. Meanwhile, 30.0% reported that their planning moderately included thoughtful and well-planned instructional approaches, and 10.0% revealed that their planning did not involve any thoughtful and well-planned instructional approaches. The result indicated that the respondents' curriculum planning practice was consistent with the literature. Correspondingly, when the respondent curriculum directors were asked if their curriculum planning focuses on aligning instructional activities and learning experiences with the previously set goals and assessments, 50.0% respondents reported that their teachers' planning focused on aligning instructional activities and learning experiences with the previously set goals and assessments whereas the same percentage, i.e., 50.0% of other respondents indicated that their teachers' planning focused on such alignment to a modest extent. Similarly, 50.0% respondents stated that their teachers' planning completely explored various instructional approaches to interpret students' understanding and knowledge. The other 50.0% respondents reported that their teachers' curriculum planning only occasionally explored different instructional approaches. The results in this study revealed that the teachers and curriculum leaders' practice was inconsistent with the literature.

The literature asserts that teachers require sufficient planning in order to equip and enable learners and give them numerous opportunities to understand and transfer learning (Wiggins & McTighe, 2005). UbD calls for employing various instructional approaches and activities that help students know the purpose of their learning, grasp the core concept, construct meaning, and manifest their understanding as the outcome of their learning (Wiggins & McTighe, 2011).

Besides, the UbD framework guides teachers in deciding instructional strategies, choosing appropriate activities, and selecting resource materials for students' enduring understanding and long-term achievement. Thoughtful instructional strategies and well-planned activities enable teachers to address the purpose of learning by scaffolding learning and helping students to find the gap between their performance and their goal (Wiggins & McTighe, 2005).

Along with thoughtful planning, Wiggins and McTighe (2005) recommended teachers to use WHERETO, an analytical tool, for building and testing the elements of the design. WHERETO is the acronym for Where, Hook, Equip, Rethink, Reflect, and Revise, Evaluate, Tailored, and Organized. Because this tool helps teachers to make students understand where and why the unit is headed, hook the students throughout their learning process, equip students with knowledge and skills, give them opportunities to rethink, reflect, revise, refine, and self-assess their work, tailor instruction to meet individual needs of students, and organize teaching and learning for maximum engagement and effectiveness (Wiggins & McTighe, 2005). They also remarked that teachers have the decisive roles to develop tools and techniques that address students' needs and support them to perform autonomously.

The responding curriculum directors were asked to rate if their curriculum planning process ensured students' understanding of "where" and "why" of the unit. 40.0% respondents indicated that their planning fully ensured students' understanding of "where" and "why" of the unit. Fifty percent of respondents reported that their planning process moderately ensured students' understanding of "where" and "why" of the unit while the rest of 10.0% reported their planning did not have such a factor. Likewise, when the responding curriculum directors were asked if their school districts' planning of curriculum and instruction empowered students to actively construct meaning using rethinking, reflection, revision, and transfer understanding,

40.0% respondents reported to have curriculum planning that empowered students to actively construct meaning whereas 60.0% reported that their curriculum planning moderately empowered students to actively construct meaning. The findings of this study suggested that the teachers and curriculum leaders' practice of Stage 3 considering its crucial elements were not coherent with the literature.

The literature proposed teachers to design instruction and craft performance tasks that engage students in hands and minds-on learning activities and that require them to continuously reflect on their own performance (Wiggins & McTighe, 2012). This also empowers students to actively construct meaning using inquiry, performance, and reflection and transfer understanding in unfamiliar situations (Wiggins & McTighe, 2011). In this process of learning, students must be challenged to accept new learning and be able to construct meaning of the ideas by connecting the discrepant pieces of their knowledge (Subban, 2006). Planning effectively and equipping students adequately allows students to reflect on their thinking, reveal their understandings, and transfer it in the real-world situation even after the scaffolding is removed (Wiggins & McTighe, 2012). This also enables students to be confident, aware, and autonomous learners thriving to take responsibility for their own learning (Subban, 2006).

Conclusions

Designing curriculum for understanding is akin to weaving a multi-colored rug with different colorful threads. The goal is the rug itself and the process of weaving using several different threads is similar to the process of employing multiple assessments and instructional approaches connected to each other to acquire the desired result. The findings of the study helped the researcher to explore the practices and process of the Understanding by Design framework in the select public school districts in central Minnesota. Understanding by Design proposes

teachers and curriculum leaders implement the UbD framework as the framework guides them in designing curriculum, assessment, and instruction successfully. The findings provided evidence that almost all the curriculum directors' school districts had employed the UbD curriculum framework in planning curriculum, assessment, and instruction that targets long term transfer goals and standards recognized in their school.

UbD advocates that the framework helps teachers to achieve the desired learning goals if they implement the essential elements and the three stages of design effectively. The UbD elements are considered essential in order to improve the curriculum designing process that helps enhance students' performance and deepen their learning. The curriculum directors were asked if the essential elements were used to promote enduring understanding and learning, and if used, to what extent they were used. Out of all the elements, the majority of the curriculum directors reported to have emphasized the core elements like teachers' content and pedagogy knowledge, focusing on core content while planning curriculum and instruction, organizing content around the big ideas, and giving teachers opportunities to craft instruction that support constructive learning to the fullest extent. The result of this study implied that the teachers and curriculum leaders in these school districts had implemented only a few UbD elements at their maximum capacity while the literature suggests that all the elements are fundamental in designing a quality curriculum and should be focused and applied equally.

The rest of the curriculum elements such as curriculum mapping, cornerstone assessments, diagnostic and formative assessments, rubrics, analyzing and revising curriculum and instructions had been sporadically employed. There were a handful of curriculum directors whose planning never included these elements. And a predominant number of curriculum directors had integrated these elements in their planning only occasionally. Only a few

respondents stated that they included these elements to the full extent. These elements are the most important aspects of designing curriculum backward. The curriculum map guides educators throughout the designing process while analyzing and revising curriculum and instruction enable educators to adjust and improve the existing curriculum. Likewise, different types of assessments and rubrics help teachers to observe students' activities and accumulate information on their understanding, knowledge, and skills. Formative assessments always have a strong impact on students as teachers can integrate intensive interventions for students' future improvement and for promoting high-level performance. In the same way, the most important elements of the UbD framework, teaching for understanding and essential questions, appeared to not have been considered by many curriculum directors. Understanding and meaning making of the core concept is the key to the UbD curriculum framework. Equipping students with knowledge and skills so that they can think critically and transfer their learning in an unfamiliar context is only possible when teachers teach for the deep understanding of a concept or an idea. Deep understanding is promoted through stimulating essential questions that allow students to explore and discover the ideas. The findings of this study helped the researcher draw the conclusion that only a limited number of curriculum leaders and their teachers understood the importance of essential questions and teaching for deep understanding.

Designing curriculum backward demands teachers and curriculum leaders incorporate the three stages of UbD as a systematic approach to effective planning. Identifying curricular priorities and specific learning goals, selecting significant content, and planning units that promote students' engagement throughout the inquiry of essential questions are the important aspects of Stage 1 planning. The majority of the curriculum directors showed that their curriculum planning thoroughly identified curricular priorities and specific learning goals as

suggested by the literature. There were a few curriculum directors who demonstrated that their planning sometimes specified the priorities and learning goals. Similarly, there was a large number of curriculum directors who reported that their school districts selected specific content that helped teachers align the curriculum with the targeted goals, and their planning process also ensured that the students were engaged throughout the inquiry of essential questions. Only a small percentage of curriculum leaders reported that their selection of specific content and ensuring students' engagement throughout the inquiry of essential questions were included in their planning process to a certain degree. The responding curriculum directors depicted the effective implementation of Stage 1 positioned in the literature. However, there were a small number of curriculum directors who reported they did not include any of these aspects in their curriculum planning process.

The Stage 2 planning includes crucial aspects such as employing six facets of understanding, students' demonstration of understanding through the six facets of understanding, students' understanding of critical concepts and performing with understanding, and providing students opportunities to self-assess and evaluate their progress. The results of the study revealed that a significant number of responding curriculum directors had included the key features of Stage 2 in their curriculum and instruction planning to a moderate level. A very small percentage of respondents reported that they fully included these features of Stage 2. On the other hand, there were also a modest number of respondents who noted they never included these aspects in their planning process. The results revealed that the students were not given abundant opportunities to self-assess and evaluate their progress and perform with understanding. The results also indicated that the teachers' use of various assessments to determine the evidence of students' understanding and the use of six facets of understanding to measure their performance

were not utilized adequately. Hence, the idea of applying critical aspects of Stage 2 for determining evidence of student understanding is rejected in this study.

Stage 3 is the final phase of a backward curriculum designing process that asks teachers and curriculum leaders to plan instructional activities and approaches to achieve the previously set goals. The results of the study provided evidence that the majority of respondents' reported curriculum planning consisted of thoughtful and well-planned instructional approaches to address the purpose of learning in contrast to the few respondents whose planning included such approaches only reasonably. Nevertheless, when investigating the implementation of other constituents of Stage 3, the results led to the conclusion that a large number of teachers exercising various instructional approaches to interpret student understanding, aligning instructional activities and learning experiences with previously set goals, ensuring students' understanding of where and why of the unit, and empowering students to actively construct meaning were insufficient. Only a handful respondents had indicated their teachers realized the significance of these factors and put them in practice for the actualization of teaching for understanding. Hence, the findings of the study helped the researcher to draw conclusions that the components and the three stages of Understanding by Design curriculum framework were unevenly executed and there was inconsistency in its implementation in the select central Minnesota school districts.

Limitations of the Study

According to Creswell (2012), limitations in the study address flaws or problems of the study identified by the researcher. Limitations that have affected the results of the study may help potential researchers with the directions for future investigation (Creswell, 2012). The researcher identified the following limitations in this study:

1. The researcher intended to conduct a mixed method study employing an online survey and open-ended interviews as the instruments to collect data. However, the Covid-19 pandemic limited the researcher's ability to find sufficient number of research participants as the impact of the pandemic and the additional work stress declined the potential participants' willingness to participate in the study.

2. The researcher acknowledged that quantitative methods using surveys was designed to collect hard facts about the curriculum planning and implementing process. It would be more credible if the study had been carried out pairing with open-ended interviews for the in-depth understanding of participants' experiences and perspectives on the planning process.

3. Due to Covid-19 pandemic, finding research participants was challenging, so the study was limited to a small demographic group which did not represent the entire population.

4. The Covid-19 pandemic also made it difficult for the researcher to approach teachers for their participation, therefore the curriculum directors were requested for their perceptions regarding the implementation of UbD in their school districts.

Recommendations for Future Practice

Research suggests that curriculum planning and designing is an integral part of an educational process, and a successful teaching and learning lie in the successful planning and designing of curriculum, instruction, and assessment. Teaching and learning is considered successful when students acquire in-depth understanding of an idea, solve problems critically, and transfer their understanding in real-life situations. The literature indicates that UbD curriculum framework helps teachers and curriculum leaders in planning and designing

curriculum effectively in order to ensure students' enduring understanding (Wiggins & McTighe, 2005). On the basis of the of the literature and the findings of this study, the following recommendations are presented for future practice:

1. To teach for understanding, it is necessary that teachers increase their own content and pedagogical knowledge and employ different approaches to instruction and assessments. The results indicated that the teachers in the respondents' school districts implemented the UbD framework to design their curriculum and their teachers had abundant content and pedagogical knowledge, however they failed to consistently use other indispensable elements of UbD such as curriculum map, diagnostic and formative assessments, instructional planning, rubrics, essential questions, and regular analysis and revision of their curriculum. It is advised that teachers use all the essential components of UbD in order to improve students' in-depth understanding and enhance their learning.

2. UbD asks teachers and curriculum leaders to design curriculum backward by clarifying the learning goals at first, planning assessments in the second stage, and then planning instruction in the third stage to ensure students' enduring understanding (Wiggins & McTighe, 2005). The results of this study showed that the majority of respondents had implemented Stage 1 by identifying the learning goals and curriculum priorities, selecting content to align the curriculum to the targeted goals, and engaging students around the essential questions as proposed by UbD. However, there were a small proportion of respondents who reported that they had never implemented all the features of Stage 1 of curriculum designing although they had implemented the UbD framework. It is recommended that teachers and curriculum

directors should design curriculum with the end in mind and utilize the necessary aspects of Stage 1 to boost students' long-term knowledge and skills.

3. The literature suggests that it is necessary for teachers to measure students' understanding and their ability to apply their understanding in order to determine if students are able to attain the desired goals. The results indicated that only a small percentage of respondents had implemented the Stage 2 aspects of UbD. While designing curriculum, teachers are to formulate effectual assessments and use at least one of six facets of understanding that enable students to demonstrate their level of understanding. Along with it, UbD also recommends teachers provide students opportunities to self-assess for the purpose of evaluating their knowledge and skills and make improvements where necessary.

4. To achieve the desired results, it is recommended to plan well-structured instructional activities, apply different approaches to instruction, align instructional activities with the goals, empower students to actively construct meaning, and ensure students' understanding. The findings of the study suggested that the majority of respondents perceived that teachers had not planned and practised these indispensable factors of Stage 3. Along with including thoughtful and well-planned instructional approaches, teachers and curriculum leaders are encouraged to plan effectively executing the Stage 3 prerequisites to support students to engage meaningfully in learning, acquire necessary skills, and perform independently and successfully.

Recommendations for Future Research

The results of this study provide opportunities for future research. The followings are the suggestions for future research from this researcher:

1. A mixed method study could offer more robust data to apprehend the implementation and impact of the UbD framework. Further research might employ quantitative tools like surveys for collecting the concrete facts and several qualitative instruments such as in-depth interviews, focused-group interviews, narrative inquiries, observations for exploring the detailed experiences and perspective of the participants, and their practice in designing and planning curriculum using the UbD framework

2. More research methodologies such as case studies or action research would be beneficial as they help researchers to focus on the practice more vigorously. The researcher could interact with the participants to seek rich descriptions of their experiences, beliefs, and ideas and construct insightful understanding which would significantly influence the collection of data and its analysis.

3. Since Understanding by Design is centered around the constructivist learning theories and it emphasizes constructivist learning through learners' active meaning-making, it would be helpful if further research is carried out to examine the impact of constructivism in curriculum planning and classroom practices.

4. One of the issues that impacts the effective implementation of UbD is that teachers were offered only one- or two-days workshops while it is imperative that there is an ongoing training and professional development workshops for the effective planning process (Brown, 2004). Research to investigate if teachers and educators are provided with adequate training on the implementation of UbD should be carried out.

5. It is recognized that there are challenges in the implementation of Understanding by Design as a curriculum framework. However, there is limited empirical research that provides verifiable evidence. Hence, it is advisable that further research is conducted

to investigate whether the framework has posed impediments and whether there are

challenges in its implementation. planning and school improvements.

6. Since teachers are involved in designing and planning curriculum, it is recommended

   to conduct further research on teachers' perceptions of the implementation of the

   UbD framework.

7. Conducting further research in K-12 public schools all over Minnesota is

   recommended to investigate how the UbD framework is implemented, its efficacy in

   curriculum planning and classroom practices, and its impact on the students' long-

   term achievement.

References

Arter, J., & McTighe, J. (2001). *Scoring rubrics in the classroom: Using performance criteria for assessing and improving student performance*. Thousand Oaks, CA: Corwin Press.

Bender, W. N. (2002). *Differentiating instruction for students with learning disabilities: Best teaching practices for general and special educators*. Thousand Oaks, CA: Corwin Press.

Bhattacherjee, A. (2012). Social science research: Principles, methods, and practices (2nd ed.). *Textbooks Collection,* 3. Retrieved fromhttp://scholarcommons.usf.edu/oa_textbooks/3

Black, P., Harrison, C., Lee, C., Marshall, B., &Wiliam, D. (2004). Working inside the black box: Assessment for learning in the classroom. *Phi Delta Kappan,86*(1), 8-21. DOI:10.1177/003172170408600105

Black, P., & Wiliam, D. (1998). Inside the black box: Raising standards through classroom assessment. *The Phi Delta Kappan, 80*(2), 39-144, 146-148.

Bowles, S., & Gintis, H. (1976). *Schooling in capitalist America: Educational reform and the contradictions of economic life*. New York, NY: Basic Books.

Bransford, J., Darling-Hammond, L., & LePage, P. (2005). Introduction. In L. Darling-Hammond & J. Bransford (Eds.), *Preparing teachers for a changing world: What teachers should learn and be able to do* (pp. 3-39). San Francisco, CA: Jossey-Bass.

Briggs, M., Woodfield, A., Martin, C., & Swatton, P. (2008). *Assessment for learning and teaching in primary schools* (2nd ed.). Exeter, UK: Learning Matters.

Brookhart, S. M. (2013). *How to create and use rubrics for formative assessment and grading*. Alexandria, VA: ASCD.

Brown, J. L. (2004). *Making the most of understanding by design*. Alexandria, VA: ASCD.

Burns, R. C. (2001). *Curriculum mapping*. Retrieved from http://www.ascd.org/publications/
　　curriculum-handbook/421.aspx

Childre, A., Sands, J. R., & Pope, S. T. (2009). Backward design: Targeting depth of
　　understanding for all learners. *Teaching Exceptional Children, 41*(5), 6-14.
　　https://doi.org/10.1177/1004005990904.100501

Chingos, M. M., & Whitehurst, G. J. (2012). *Choosing blindly: Instructional materials, teacher*
　　effectiveness, and the common core. Brown Center on Education Policy. Retrieved from
　　https://www.brookings.edu/wp-content/uploads/2016/06/0410_curriculum_chingos_
　　whitehurst.pdf.

Cho, J., & Trent, A. (2005). Backward curriculum design and assessment: What goes around
　　comes around, or haven't we seen this before. *Taboo: The Journal of Culture and*
　　Education, *9*(2), 105-122. Retrieved from https://files.eric.ed.gov/fulltext/EJ795704.pdf

Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education* (6th ed.). New
　　York: Routledge.

Cohen, L., Manion, L., & Morrison, K. (2018). *Research methods in education* (8th ed.). Oxon:
　　Routledge.

Creswell, J. W. (2009). *Research design* (3rd ed.)*.* New Delhi: Sage Publications.

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative*
　　and qualitative research (4th ed.). Boston, MA: Pearson Education, Inc.

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods*
　　approaches (4th ed.)*.* Thousand Oaks, CA: Sage Publications.

Creswell, J. W., & Creswell, D. (2018). *Research design: Qualitative, quantitative, and mixed*
　　methods approaches (5th ed.)*.* Thousand Oaks, CA: SagePublications.

Darling-Hammond, L. (2006). *Powerful teacher education: Lessons from exemplary programs*. San Francisco, CA: Jossey-Bass.

Darling-Hammond, L. (2010). *The flat world and education: How America's commitment to equity will determine our future.* New York, NY: Teachers College Press.

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2019). Implications for educational practice of the science of learning and development. *Applied Developmental Science*. https://doi.org/10.1080/10888691.2018.1537791

Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development* (research brief). Palo Alto, CA: Learning Policy Institute.

DelliCarpini, M. (2006). Scaffolding and differentiating instruction in mixed ability ESL classes using a Round Robin activity. *The Internet TESL Journal, 12*(3). Retrieved from http://iteslj.org/

Department of Education. (2000). *Before it's too late: A report to the nation from the National Commission on Mathematics and Science Teaching for the 21st century*. Washington, DC: Author.

Desimone, L. M., & Garet, M. S. (2015). Best practices in teachers' professional development in the United States. *Psychology, Society and Education,7*(3), 252-263.

Diaz-Maggioli, G. H. (2003). Options for teacher professional development. *English Teaching Forum, 41*(2). Retrieved from https://americanenglish.state.gov/files/ae/resource_files/03-41-2-e.pdf

Dixon, F. A., Yssel, N., McConnell, J. M., & Hardin, T. (2014). Differentiated instruction, professional development, and teacher efficacy. *Journal for the Education of the Gifted,37*(2), 111-127. Retrieved fromhttps://doi.org/10.1177/0162353214529042

Friedel, C., Irani, T., Rudd, R., Gallo, M., Eckhardt, E., & Ricketts, J. (2008). Overtly teaching critical thinking and inquiry-based learning: A comparison of two undergraduate biotechnology classes. *Journal of Agricultural Education, 49*(1).

Friedman, I. C. (2011). *Education reform: Revised edition*. New York: Facts On File, Inc. ISBN 978-1-4381-3397-3 (e-book).

Fullan, M. (2005). *The new meaning of educational change*. (3rd ed.). London: RoutledgeFalmer

Fullan, M. (2007). *The new meaning of educational change*. (4th ed.). New York, NY: Teachers College Press.

Gak, D. M. (2011). *Textbook-an important element in the teaching process*. Retrieved from metodickividici.ff.uns.ac.rs >index.php>article>download

George, P. S. (2005). A rationale for differentiating instruction in the regular classroom. *Theory into Practice, 44*(3), 185-193.

Glasersfeld, E. V. (2005). Learning and adaptation in the theory of constructivism. In L. Smith (Ed.), *Critical readings on Piaget*. Taylor & Francis e-Library. ISBN 0-203-43585-0

Glatthorn, A. A., Carr, J. F., & Harris, D. E. (2001). Planning and organizing for curriculum renewal. *Curriculum handbook.* ASCD.

Glatthorn, A. A., Jailall, J. M., & Jailall, J. K. (2017). *The principal as curriculum leader: Shaping what is taught and tested* (4th ed.). Thousand Oaks, CA: Corwin, Sage Publications.

Gollub, J. P., Bertenthal, M. W., Labov, J. B., & Curtis, P. C. (Eds.). (2002). Designing curriculum, instruction, assessment, and professional development. In *Learning and understanding: Improving advanced study of mathematics and science in U.S. high schools*. Washington, DC: National Academy Press.

Goodwin-Glick, K. L. (2017). *Impact of trauma-informed care professional development on school personnel perceptions of knowledge, dispositions, and behaviors toward traumatized students.* (Unpublished doctoral dissertation). Bowling Green State University.

Graff, N. (2011). An effective and agonizing way to learn: Backward design and new teachers' preparation for planning curriculum. *Teacher Education Quarterly, 38*(3), 151-168.

Gregory, G. H., & Kuzmich, L. (2011). Curriculum approaches for data driven instruction. In G. H. Gregory (Ed.), *Differentiated instruction.* Thousand Oaks, CA: Corwin.

Guskey, T. R. (2003). How classroom assessments improve learning. *Educational Leadership, 60*(5), 6-11.

Harris, A. R. (2010). *Investigating efforts to change educator attitudes and teaching strategies through professional development focused on the use of backward design curriculum and the principles of efficacy: Educator behavior*. Unpublished doctoral dissertation). Lindenwood University.

Hattie, J. (2003, October). *Teachers make a difference: What is the research evidence?* [Conference presentation]. 2003 Australian Council for Educational Research (ACER). Retrieved from https://research.acer.edu.au/cgi/viewcontent.cgi?article=1003&context=research_conference_2003.

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. New York, NY: Routledge.

Hibbard, K. M., Wagenen, L. V., Lewbel, S., Waterbury-Wyatt, S., Shaw, S., Pelletier, K., …Wislocki, J. A. (1996). *A teacher's guide to performance-based learning and assessment.* Alexandria, VA: ASCD.

Jacobs, H. H. (Ed.). (2010). *Curriculum 21: Essential education for a changing world*.

    Alexandria, VA: ASCD.

Jenkins, J. (2005). Implementing an international approach to English pronunciation: The role of

    teacher attitudes and identity. *TESOL Quarterly, 39*(3). DOI:10.2307-3588493

Kapambwe, W. M. (2010). The implementation of school bases continuous assessment in

    Zambia. *Educational Research and Reviews*, *5*(3), 099-107.

Kelting-Gibson, L. M. (2005). Comparison of curriculum development practices. *Educational*

    Research Quarterly, 29(1), 26-36.

Kliebard, H. M. (2004). *American curriculum:1893-1985* (3rd ed.). New York: Routledge

    Falmer.

Kopera-Frye, K., Mahaffy, J., & Svar, G. M. (2008). The map to curriculum alignment and

    improvement. *Collected Essays on Teaching and Learning*.

    DOI: 10.22329/celt.v1i0.3171

Kridel, C. (2010). Tyler, Ralph W. *Encyclopaedia of curriculum studies*. Thousand Oaks: Sage

    Publications, Inc. DOI: http://dx.doi.org/10.4135/9781412958806.n478

Law, B., & Eckes, M. (2007). *Assessment and ESL: An alternative approach.* Winnipeg: Portage

    & Main Press.

McGlynn, K., & Kelly, J. (2017). Using formative assessments to differentiate instruction.

    Science Scope, 42(4), 22-25.

McTighe, J., & Seif, E. (2003). A summary of underlying theory and research base for

    understanding by design. *UbD Research Base.* Retrieved from https://secureservercdn.

    net/198.71.233.9/4ba.49d.myftpupload.com/wp-content/uploads/2011/04/UbD-Research-

    Base.pdf

McTighe, J., & Seif, E. (2011). *Teaching for understanding: A meaningful education for 21st century learners.* Retrieved from https://www.jaymctighe.com/wp-content/uploads/ 2011/04/Teaching-for-Understanding.pdf

McTighe, J., Seif, E., & Wiggins, G. (2004). You can teach for meaning. *Educational Leadership, 62*(1), 26-30.

McTighe, J., & Thomas, R. S. (2003). Backward design for forward action. *Educational Leadership, 60*(5), 52-55.

McTighe, J., & Wiggins, G. (1999). *The understanding by design handbook*. Alexandria, VA: ASCD.

McTighe, J., & Wiggins, G. (2011). *The understanding by design guide to creating high-quality units*. Alexandria, VA: ASCD.

McTighe, J., & Wiggins, G. (2012a). *Understanding by design framework*. Alexandria, VA: ASCD.

McTighe, J., & Wiggins, G. (2012b). *From common core standards to curriculum: Five big ideas.* Retrieved from https://grantwiggins.files.wordpress.com/2012/09/ mctighe_wiggins_final_common_ core_standards.pdf

Mikre, F. (2010). Review article: The roles of assessment in curriculum practice and enhancement of learning. *Ethiopian Journal of Education and Sciences, 5*(2). DOI: 10.4314/ejesc.v5i2.65376 Retrieved from https://www.ajol.info//index.php/ ejesc/article/view/65376

Mills, J., Wiley, C., & Williams, J. (2019). This is what learning looks like! Backward design and the framework in first year writing. *Libraries and the Academy, 19*(1), 155-175.

Mizell, H. (2010). *Why professional development matters.* Oxford, OH: Learning Forward.

Mohan, R. (2011). *Teacher education.* New Delhi: PHI Learning Pvt., Ltd.

National Board for Professional Teaching Standards (NBPTS). (2016). *What teachers should know and be able to do*. Retrieved from http://accomplishedteacher.org/wp-content/uploads/2016/12/NBPTS-What-Teachers-Should-Know-and-Be-Able-to-Do-.pdf

National Research Council. (2001). *Classroom assessment and the National Science Education Standards*. M. Atkin, P. Black, & J. Coffey (Eds.). Center for Education, Division of Behavioral and Social Sciences and Education. Washington, DC: National Academy Press.

National Research Council. (2002). *Learning and understanding: Improving advanced study of mathematics and science in U.S. high schools.* Committee on Programs for Advanced Study of Mathematics and Science in American High Schools. J. P. Gollub, M. W. Bertenthal, J. B. Labov, & P. C. Curtis (Eds). Center for Education, Division of Behavioral and Social Sciences and Education. Washington, DC: National Academy Press.

Nebesniak, A. L. (2012). Effective instruction: A mathematics coach's perspective. *The Mathematics Teacher,106*(5), 354-358.

Oakes, J., & Saunders, M. (2002). *Access to textbooks, instructional materials, equipment, and technology: Inadequacy and inequality in California's public schools*. UCLA: 's Institute for Democracy, Education, and Access. Retrieved from https://escholarship.org/uc/item/4ht4z71v

Pham, H. L. (2012). Differentiated instruction and the need to integrate teaching and practice. *Journal of College Teaching & Learning, 9*(1).

Pinar, W., & Irwin, R. (2005). *Curriculum in a new key: The collected works of Ted. T. Aoki*. Mahwah, NJ: Lawrence Erlbaum Associates.

Plate, R. (2012). The evolution of curriculum development in the context of increasing social and environmental complexity. *Creative Education, 3*(8), 1311-1319. Retrieved from http://www.SciRP.org/journal/ce

Polikoff, M. S. (2015). How well aligned are textbooks to the common core standards in mathematics? *American Educational Research Journal, 52*(6), 1185-1211. Retrieved from https://www.jstor.org/stable/24546766

Popham, W. J. (2009). *Instruction that measures up: Successful teaching in the age of accountability*. Alexandria, VA: ASCD.

Popham, W. J. (2011). *Transformative assessment in action: An inside look at applying the process.* Alexandria, VA: ASCD.

Porter, A. C. (2002). Measuring the content of instruction: Uses in research and practice. *Educational Researcher,31*(7), 3-14.

Rury, J. (2002). *Education and social change: Themes in the history of Americans schooling.* New Jersey: Lawrence Erlbaum Associates.

Simon, M. K. (2001). *Dissertation and scholarly research: Recipes for success (Ed.).* Seattle, WA: Dissertation Success, LLC.

Sousa, D. A., & Tomlinson, C. A. (2011). *Differentiation and the brain: How neuroscience supports the learner-friendly classroom*. Bloomington, IN: Solution Tree Press.

Subban, P. (2006). Differentiated instruction: A research basis. *International Education Journal, 7*(7), 935-947.

Suter, W. N. (2012). *Introduction to educational research: A critical thinking approach.* New
Delhi: Sage Publications.

The Glossary of Education Reform. (2016). *Content knowledge*. Retrieved from
https://www.edglossary.org/content-knowledge/

Tomlinson, C. A. (2000). Differentiation of Instruction in the elementary grades. *ERIC Digest*.
ED443572.

Tomlinson, C. A. (2001). *How to differentiate instruction in mixed-ability classrooms*.
Alexandria, VA: ASCD.

Tomlinson, C. A. (2014). *The differentiated classroom: Responding to the needs of all learners*.
(2nd ed.). Alexandria, VA: ASCD.

Tomlinson, C. A., Brighton, C., Hertberg, H., Callahan, C. M., Moon, T. R., Brimijoin, K., … &
Reynolds, T. (2003). Differentiating instruction in response to student readiness, interest,
and learning profile in academically diverse classrooms: A review of literature. *Journal
for the Education of the Gifted, 27*(2/3), 119-145.

Tomlinson, C. A., Brimjoin, K., & Narvaez, L. (2008). *The differentiated school: Making
revolutionary changes in teaching and learning*. Alexandria, VA: ASCD.

Tomlinson, C. A., Kaplan, S. N., Renzulli, J. S., Purcell, J., Leppien, J., & Burns, D. (2002). *The
parallel curriculum: A design to develop high potential and challenge high-ability
learners*. Thousand Oaks, CA: Corwin Press.

Tomlinson, C. A., & McTighe, J. (2006). *Integrating differentiated instruction & understanding
by design: Connecting content and kids*. Alexandria, VA: ASCD.

Tomlinson, C. A., & Strickland, C. A. (2005). *Differentiation in practice: A resource guide for
differentiating curriculum*. Alexandria, VA: ASCD.

U.S. Department of Education, The National Center for Education Statistics. (n.d.). Curriculum. *Pursuing excellence: A study of U.S. eighth-grade mathematics and science teaching, learning, curriculum, and achievement in international context*. Washington, DC: Author.

Wall, D. (2005). The impact of high-stakes testing on classroom teaching: A case study using insights from testing and innovation theory. *Studies in Language Testing,22*, 22-48.

Wall, J., & Ryan, S. (2010). *Resourcing for curriculum innovation: Learning in a changing world.* Victoria, Australia: ACER.

Wiggins, G. (2010). What is a big idea? *Big Ideas.* Retrieved from https://www. authenticeducation.org/ae_bigideas/article.lasso?artid=99

Wiggins, G., & McTighe, J. (1998). *Understanding by design*. Alexandria, VA: ASCD.

Wiggins, G., & McTighe, J. (2005). *Understanding by design* (2nd ed.). Alexandria, VA: ASCD.

Wiggins, G., & McTighe, J. (2007). *Schooling by design: Mission, action, and achievement*. Alexandria, VA: ASCD.

Wiggins, G., & McTighe, J. (2011). *Understanding by design guide to creating high-quality units*. Alexandria, VA: ASCD.

Wiggins, G., & McTighe, J. (2012). *The understanding by design guide to advanced concepts in creating and reviewing units*. Alexandria, VA: ASCD.

Windschitl, M. (2009). Cultivating 21st century skills in science learners: How systems of teacher preparation and professional development will have to evolve. *National Academies of Science Workshop on 21st Century Skills,* pp. 5-6.

Woodward, A., & Elliott, D. L. (1992). Teacher professionalism school reform and textbooks. *Educational Horizons,70*(4), 176-180. Phi Delta Kappa International. Retrieved from https://www.jstor.org/stable/42924960

Wraga, W. G. (2017). Understanding the Tyler rationale: Basic principles of curriculum and instruction in historical context. *Espacio, Tiempo Y Educación, 4*(2), 227-252. DOI: http://dx.doi.org/10.14516/ete.156

Appendix A: Survey Questionnaire

An Evaluation of the Implementation of Understanding by Design Processes in Select Minnesota Public Schools

Thank you for taking the time to complete the survey. The purpose of this survey is to obtain knowledge about the practices of curriculum planning and instruction in the select Minnesota public school districts. Your inputs are highly valued and will be usefully applied to enhance and increase the understanding and practices of Understanding by Design as a backward design of curriculum.

Terminology

Backward Design: Backward design is an approach to construct a curriculum that emphasizes identifying and setting the objective at first, and then determining assessment and activities that help support students in comprehending and responding to complex tasks and become self-directed learners (McTighe & Wiggins, 2012a).

Understanding by Design: Understanding by Design (UbD) is a curriculum planning framework that holds the same rationale of backward design. UbD provides tools and guidance for educators to design curriculum and instruction that support students for a deeper level of understanding and that provide students multiple opportunities to transfer their learning in meaningful contexts (McTighe & Wiggins, 2005a).

Big Ideas: Big ideas are the core concepts, principles, themes, or theories that are considered as the main part of curriculum, instruction, and assessment. They are the tools for yielding the depth of meaning by connecting facts and skills, focusing on the larger concepts, and providing the base for understanding and transfer. (Wiggins & McTighe, 2005).

Essential Questions: Essential questions rest at the core of a subject or a curriculum and promote different plausible answers by uncovering knowledge and understanding of the concept (Wiggins & McTighe, 2005).

Six Facets of Understanding: UbD proposes six facets of understanding through which students can demonstrate their true understanding and transfer their learning. The six facets are: *Explanation, Interpretation, Application, Perspective, Empathy, Self-knowledge.*

Demographic Information

Please indicate your school's enrollment size.

- o Less than 1000 students
- o 1000-2000 students
- o 2000-3000 students
- o More than 3000 students

Please indicate the highest academic degree you have obtained.

- o Bachelors
- o Master's
- o Specialist
- o Doctorate

Please indicate the number of years you have been a professional educator.

- o 0-3
- o 4-6
- o 7-9
- o 10 and more

Listed below are the backward design components that teachers are implementing in the

elementary classrooms. Please read each item and response the extent to which you practice for

students' understanding in the differentiated classrooms.

1. What components of the backward design process do curriculum leaders in select Minnesota

school districts report practicing for enduring understanding among elementary students in their

classrooms?

	Not at all	Somewhat	Fully
1. Our teachers plan curriculum and instruction using curriculum framework that targets long term transfer goals and standards recognized in my school.			
2. Our teachers have adequate knowledge of content and classroom pedagogy.			
3. The curriculum mapping includes and emphasizes the goals that ensure students achievement.			
4. Our curriculum, instruction, and assessment planning focus on the core content that aims at students' learning and in-depth understanding.			
5. Our district organizes content around the Big Ideas and are framed around essential questions that help uncover the content.			
6. Our teachers teach for deeper understanding of key concepts and ideas rather than teaching for recalling of facts and formulas.			
7. Our planning focuses on ensuring that the essential questions are established and examined throughout the unit.			
8. Our district curriculum planning includes cornerstone assessments to collect information as evidence of students' attainment of goals.			
9. In our district, assessments are constructed in such a way that help students determine when, where, why, and how to use the knowledge.			

10. In our district, assessment planning includes rubrics and/or performance standards as evaluation tools that help clarify instructional goals.			
11. The curriculum planning process provides opportunities for teachers to exercise instruction that support constructive learning.			
12. In our district, planning of curriculum and instruction includes diagnostic assessments that assist in learning about the strengths and weaknesses of students.			
13. In our district, planning of curriculum and instruction includes formative assessment for observing students' tasks and accumulating information on their understandings, skills, and knowledge.			
14. In our district, planning of curriculum and instruction includes continuous analysis and revision of the curriculum and instructions for building students' enduring understanding.			

Listed below are three essential stages of backward planning of curriculum that teachers are following while planning curriculum. Please read each item and response the extent to which you practice the stages for students' understanding in the differentiated classrooms.

2. To what extent are Stages 1, 2, and 3 of Understanding by Design used in the differentiated classroom as reported by teachers in select Minnesota school districts?

	Not at all	Somewhat	Fully
1. In our district, curriculum planning identifies curricular priorities and identifies the specific learning goals.			
2. In our district, the selection of significant content helps teachers align the curriculum with the targeted goal.			
3. In our district, curriculum planning involves thoughtful and well-planned instructional approaches to address the purpose of learning.			
4. In our district, curriculum planning focuses on aligning instructional activities and learning experiences with previously set goals and assessments.			

5. In our district, our curriculum planning explores various instructional approaches to assess the understanding and knowledge that students have achieved.			
6. Our district uses one or more of the six facets of understanding - *Explanation, Interpretation, Application, Perspective, Empathy, Self-knowledge* - as indicators for the assessments to reveal students' understanding.			
7. In our district, students are given opportunities to construct meaning and demonstrate understanding using the six facets of understanding.			
8. The curriculum planning process ensures students' understanding of "where" and "why" of the unit.			
9. The curriculum and instruction planning process ensures students are engaged throughout the inquiry of essential questions.			
10. In our district, our planning of curriculum and instruction empowers students to actively construct meaning using rethinking, reflection, revision, and transfer understanding.			
11. Our curriculum planning process includes opportunities for students to self-assess and evaluate their progress.			
12. The curriculum and instruction planning process ensures students understand critical concepts and provides them opportunities to perform with understanding.			

Thank you.

Appendix B: Participation Invitation

Dear (Invitee),

My name is Sangeeta Pradhan Joshi. I am a doctoral student at St. Cloud State University, School of Education. My dissertation supervisor Dr. Jim Johnson helped me to get access to your email address. I am kindly requesting your participation in a doctoral research study that I am conducting titled: An Evaluation of the Implementation of Understanding by Design Processes in Select Minnesota Public Schools. The purpose of the study is to examine teachers' planning of curriculum, instruction, and assessment using the essential elements and the three stages of Understanding by Design in the select school districts in central Minnesota. The study will also investigate to what extent the key principles and the essential elements of UbD were practiced for students' enduring understanding.

The study involves completing the survey questionnaire. Participation is completely voluntary, and you may withdraw from the study at any time. The study is completely confidential, and you will be protected from any type of harm, or discomfort.

Your participation in the research will be of great importance to help K-12 public school teachers and administrators in implementing Understanding by Design as a backward model of curriculum planning in elementary classrooms to stimulate students' understanding and performance over the longer term.

If you would like to participate in the study, please read and sign the Informed Consent letter attached.

Thank you for your time and participation.

Sangeeta Pradhan Joshi

Appendix C: Informed Consent

Title: An Evaluation of the Implementation of Understanding by Design Processes in Select

Minnesota Public Schools

You are invited to participate in a research study about the implementation of Understanding by

Design in designing curriculum and Instruction in select Minnesota public school districts.

Background of the Study

Understanding by Design (UbD) is a backward design curriculum framework that is based on the

idea that a plan becomes successful if it starts with the end in mind. UbD is implemented to

improve key areas of education in many school districts throughout the United States (McTighe

& Seif, 2003). However, Understanding by Design lacks empirical evidence that shows its

effective implementation in improving learning outcomes in K-12 school settings. Limited

information is found whether teachers have been implementing UbD framework effectively in

designing curriculum and planning instruction to help students obtain in-depth understanding and

apply their knowledge in real-life situations. This study will explore teachers' planning of

curriculum, instruction, and assessment using the essential elements and the three stages of

Understanding by Design.

Purpose of the study

The purpose of the study is to examine teachers' planning of curriculum, instruction, and

assessment using the essential elements and the three stages of Understanding by Design in the

select school districts in central Minnesota. The study will also investigate to what extent the key

principles and the essential elements of UbD were practiced for enduring understanding among

elementary students in K-12 public school districts in central Minnesota.

Description of Participation/Study Procedure

If you agree to be part of the research study, you will be asked to complete a questionnaire regarding your background information and experience practicing UbD curriculum framework.

Duration of the Study

It will take you half an hour to fill up the survey questionnaire.

Benefits of the Study

While there are no direct benefits to you for participating, you will be contributing to further understanding of the Understanding by Design framework and assisting educators in identifying essential components of UbD to improve curriculum planning, instruction, and assessment.

Risks and Discomforts

The researcher will carry out ethical duties to respect and protect the participants. There are no anticipated risks or discomforts in this study.

Confidentiality

Data collected will remain confidential. No one will have access to your records other than the researcher and her supervisor. In any dissemination of this research (e.g., dissertation, journal article, conference presentation), pseudonyms will be used to ensure confidentiality of all the participants. Data will be reported and presented in aggregate (group) form or with no more than two descriptors presented together. Your responses will be kept strictly confidential, and your name will not be disclosed. During the participation you may refuse to answer any questions. All consent forms and other information collected data will be retained in a locked file cabinet (paper documents) or on a password-protected computer (e-files). All the data will be disposed of when the study is completed.

Voluntary Participation/Withdrawal

Participating in this study is completely voluntary. Your decision whether or not to participate

will not affect your current or future relations with St. Cloud State University, or the researcher.

If you decide to participate, you are free to withdraw at any time without any penalty.

Research Result

Results of the study can be requested from the researcher or can be obtained from the St. Cloud

State University Repository.

Contact Information

If you have questions about this research study, you may contact Sangeeta Pradhan Joshi

(xxxxxxxxx) or Dr. Jim Johnson (xxxxxxxxx).

Acceptance to Participate

Your signature indicates that you are at least 18 years of age, you have read the information

provided above, and you have consent to participate.

_____   _____

Signature   Date

Appendix D: IRB Protocol

ST. CLOUD STATE
U N I V E R S I T Y
EDUCATION FOR LIFE.

Institutional Review Board (IRB)

720 4th Avenue South AS 210, St. Cloud, MN 56301-4498

Name: Sangeeta Pradhan Joshi

Email: spradhanjoshi@stcloudstate.edu

IRB PROTOCOL DETERMINATION: Exempt Review

Project Title: The Impact of Understanding by Design in Designing Curriculum and Instruction for Elementary Classrooms in Minnesota Public Schools

Advisor James Johnson

The Institutional Review Board has reviewed your protocol to conduct research involving human subjects. Your project has been: **APPROVED**

Please note the following important information concerning IRB projects:

- The principal investigator assumes the responsibilities for the protection of participants in this project. Any adverse events must be reported to the IRB as soon as possible (ex. research related injuries, harmful outcomes, significant withdrawal of subject population, etc.).

- For expedited or full board review, the principal investigator must submit a Continuing Review/Final Report form in advance of the expiration date indicated on this letter to report conclusion of the research or request an extension.

-Exempt review only requires the submission of a Continuing Review/Final Report form in advance of the expiration date indicated in this letter if an extension of time is needed.

- Approved consent forms display the official IRB stamp which documents approval and expiration dates. If a renewal is requested and approved, new consent forms will be officially stamped and reflect the new approval and expiration dates.

- The principal investigator must seek approval for any changes to the study (ex. research design, consent process, survey/interview instruments, funding source, etc.). The IRB reserves the right to review the research at any time.

If we can be of further assistance, feel free to contact the IRB at 320-308-4932 or email ResearchNow@stcloudstate.edu and please reference the SCSU IRB number when corresponding.

IRB Chair:

Dr. Mili Mathew
Chair and Graduate Director
Assistant Professor
Communication Sciences and Disorders

IRB Institutional Official:

Maria-Claudia Tomany

Dr. Claudia Tomany
Associate Provost for Research
Dean of Graduate Studies

OFFICE USE ONLY

SC SU IRB# 2001 - 2598	Type: Exempt Review	Today's Date: 12/16/2020
1st Year Approval Date: 12/15/2020	2nd Year Approval Date:	3rd Year Approval Date:
1st Year Expiration Date:	2nd Year Expiration Date:	3rd Year Expiration Date:

ST. CLOUD STATE
UNIVERSITY
EDUCATION FOR LIFE.

Institutional Review Board (IRB)

720 4th Avenue South AS 210, St. Cloud, MN 56301-4498

Continuing Review / Final Report

Principal Investigator: **Sangeeta Pradhan Joshi**

Co-Investigator:

Project Title: **The Impact of Understanding by Design in Designing Curriculum and Instruction for Elementary Classrooms in Minnesota Public Schools**

St. Cloud State University requires all research activities involving human subject – whether or not they are supported by Federal funds – to comply with the Federal Policy of the Protection of Human Subjects (45 CFR 46). According to this policy, ongoing research activities involving human subjects must be reviewed by the IRB, at a minimum of at least once per year. In some cases, such as when research poses a significant risk, the IRB may require more frequent reviews.

This form must be submitted before your study expiration date. (as indicated on your approval letter)

Proposed changes to the protocol of study documents may NOT be implemented until after the IRB has approved the modification

1. Please indicate the status of your project:
   (Choose only one of the following)

   ____ Continuing Review:
   ____ Subject recruitment/enrollement continues; current consent/assent required, please attach.
   ____ Data collection continues with enrolled subjects; no additional subjects will be recruited.

   _X_ Final Report
   _X_ Project has been completed.
   ____ Data collection has been completed but data analysis continues.
   ____ The project has not and will not be conducted: Please explain:

2. How many participants have participated in your study? _10_____

3. Have any unexpected reactions, complications or problems occurred during this study?
   _X_ No
   ____ If YES, please explain:

4. Have any subjects withdrawn from the study - either voluntarily or at the researcher's request?
   ____ No
   _X_ If YES, please explain: At first there were 14 participants who signed the consent form. Then two withdrew from the study making the total number of participants 12. Again, another two participants withdrew after they responded the demographic questions. So, the total number of participants who responded all the survey questions were 10.

5. Have any subjects complained about the study?
   _X_ No
   ____ If YES, please explain:

6. Has any new information been identified that may affect the willingness of current or future subjects to participate in this study?
   _X_ No
   ____ If YES, please explain and indicate how it was or will be conveyed to subjects:

7. Have any changes been made to your study (including changes to informed consent docutments, debriefing statements, recruitment materials, etc.) since it was approved by the IRB? No

Sangeeta Pradhan Joshi   4/5/2021
_____   _____
Principal Investigator's Signature   Date   SCSU IRB# **2001 - 2598**