AN EXPLORATORY CASE STUDY OF STUDENT GRIT WITH EDUCATIONAL TECHNOLOGY IN LEARNING ENVIRONMENTS

by

Crystal Rees

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Philosophy

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APPROVED BY:

Dr. Jerry Woodbridge, Ph.D., Committee Chair

Dr. Joanne Gilbreath, Ed. D., Committee Member

Abstract

The purpose of this exploratory case study was to understand the expectations Generation Alpha (Gen Alpha), those born between 2010 and 2024, has on educational technology (edtech) in learning environments and how those students rate their grit with 12 participants in third through ninth grade. The theory guiding this study was grit theory by Angela Duckworth regarding grit. This qualitative study was conducted with 12 student participants in their learning environment using a qualitative questionnaire, student interview, and student observation during their dedicated homework time. Memoing was used during observations and interviews to record common phrases between participants when describing their interactions with edtech and personal technology choices. Read, write, and remember were the most common words for edtech interactions. Create, research, and collaborate were the most common words for technology used outside of the learning environment indicating a significant difference in technology norms amongst Gen Alpha learners. A synthesis of the data revealed two predominate themes: Technology as a tool to help and Technology as a means for communication. There was a contrast in subthemes as personal technology was seen as an interactive tool to facilitate higher-order actions where edtech was seen as a passive tool to deliver content or track progress.

Keywords: educational technology, student engagement, grit, grit theory, experiential learning, personalized learning, Gen Alpha learners

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List of Abbreviations

Educational technology (edtech)

Eduniversal Evaluation Agency (EEA)

Research Review Board (RRB)

Artificial Intelligence (AI)

Generation Alpha (Gen Alpha, iGen)

Total Package Hockey (TPH)

National Center for Education Statistics (NCES)

Modern Learning Environments (MLEs)

CHAPTER ONE: INTRODUCTION

Overview

Generation Alpha students, those born after the year 2010 and entirely in the digital world, demonstrate a lack of motivation and decreased confidence that they can become successful through their current avenues (Kurdi & Archambault, 2020). The Eduniversal Evaluation Agency (EEA) proposes Gen Alpha will be more assimilated to Artificial Intelligence (AI) reasoning than human conventional reasoning (EEA, 2019). While more research is needed to understand exactly why Gen Alpha is disengaging in classrooms, it is reasonable to ascertain these students will come to classrooms with expectations regarding technology. The historical context will explore these expectations and recent data on disengagement that may be a symptom of when these expectations are not met. What Gen Alpha learners experience outside of the classrooms may be largely different than what occurs in their classrooms, creating a disjointed learning experience or increasing cognitive load to adjust to an unfamiliar workflow. The social context will explore more current expectations with technology and edtech along with those affected by the problem and possible solutions in more detail. The theoretical context will explore previous studies of a positive relationship between engagement, academic achievement, and grit, or the ability to sustain interest and sustain effort when faced with obstacles (Bozgun & Akin-Kostereliglu, 2021; Duckworth et al., 2007; Hodge et al., 2018). Experiential learning theory posits that students who have control in the nature and direction of their learning stay connected and engaged (Kolb & Kolb 2009). Together, these theories suggest students in control of their learning may be more engaged and have more grit and higher academic achievement (Karlen et al., 2019). The purpose of this exploratory case study was to understand the expectations Generation Alpha (Gen Alpha), those born between 2010 and 2024, has on

educational technology (edtech) in learning environments and how those students rate their grit with 12 participants in third through ninth grade.

Background

A synthesis of the recent literature reveals that students are disengaging in classrooms at alarming rates with as many as 47% of students not being engaged according to a Gallup student study (Hodges, 2018). Student disengagement and teacher-centric models can be attributed to poor academic achievement (Bond et al., 2020). Previous studies suggest meaningfully integrated educational technology has increased student engagement and improved learning (Aguirre-Muñoz & Pantoya, 2016; Bond et al., 2020; Chism & Wilkins, 2018; Liu et al., 2017; Mackenzie et al., 2017), yet there is a disconnect in how edtech is used between students and educators in some studies (Weninger, 2018). The historical context of the successes and failures of edtech enhanced literacy instruction is intended to provide insight into the rationale for this case study to understand the origination and evolution of the problem. Social context includes the perception of edtech and its' perceived generational cohort trends for Gen Alphas. To understand how this problem might be addressed by further research, grit theory and experiential learning theory will underpin the research.

Historical Context

Educators and students have different expectations of edtech in learning, perhaps in what it can do and what it should do to affect student grit. In a national study by Gallup (Hodges, 2018) of students, they reported only 47% were engaged in the classroom. Passive disengagement is characterized by a lack of grit or effort towards academics (Bond et al., 2020). Duckworth (2022) defines grit as passion and perseverance towards long-term goals. It is a withdrawal of students physically, cognitively, and sometimes emotionally (Greener, 2018). In a

survey of 2,462 educators, nearly 90% had a negative view of technology (Purcell et al., 2013). There are a significant number of educators who do not believe technology is helpful for learning and 42% of teachers do not feel positive and optimistic about personalized learning (Education Week Research Center, 2019; Klein, 2019). Historically, teachers have been skeptic of technology as a resource in the classroom, and despite the growing predominance of technology in the world, many have not changed their view. Despite the prevalence of edtech tools, COVID-19 emergency remote learning reported all-time lows in engagement. Virtual learning schools have been around for decades with a degree of success in higher education. As of 2009, more than 4.6 million students across the United States were enrolled in online courses, which is well before the COVID-19 shift to emergency virtual learning that put nearly all college courses online (Visual Academy, 2022). While it is less common amongst K-12 environments, there are many that still existed as early as 2003 in Eugene, Oregon with states like Kansas and New York quickly following with state-wide options. Traditional systems struggled to provide appropriate engagement models in an emergency virtual transition in 2020, while there was example of virtual learning schools that engaged students regularly. The comparison between these two situations is not the focus of the study, but rather their historical contexts. The fact that the independent learning model with edtech could work and has seen a tremendous growth in popularity during the pandemic and since, is important. Some experts report tutorials and facilitate learning modules was the key to success (Payne, 2019). This represents edtech as a support tool through the progression of learning, rather than to entertain the learner, a difference between expectations of edtech in a learning environment in a case study of 32 students (Weninger, 2018).

According to Kolb and Kolb (2009), students in control of the nature and direction of

their learning journey, rather than a singular practice or point chosen by a teacher, represents experiential learning theory and increases student engagement. Looking at the historical content of digital learning, more research needs to be done to understand how previous successful models could apply to elementary students and if there is a transference of the independent remote model with edtech enhanced learning to independent edtech enhanced learning within a classroom.

With educators not having the same expectations for edtech in learning, Gen Alpha students may be most affected by this difference, and the difference may be greater than educators realize. In some cases, educators are openly hostile towards technology in the classroom. Reasons for this hostility will be explored in the literature review, but overall, educators are more negative about technology than their Gen Alpha learners. In my exploratory case study, the goal is to understand students' expectations of edtech enhanced learning and how students rate their ability to persevere and persist with edtech enhanced instruction to equip educators in providing more experiential learning through edtech that yields higher student grit.

Social Context

The historical context discussed the successes and failures of independent edtech enhanced learning through virtual learning. While exploring the social context of edtech enhanced learning it became apparent how students and educators could have very different expectations and applications towards learning with edtech tools. The primary focus is on the Gen Alpha students and how this impacts the level of girt demonstrated when using edtech tools. There may be some transference of principles used in successful virtual learning environments that can be applied to traditional schools as an educational system that are the focus of my proposed case study. Likewise, communities surrounding local education systems have reported

a drop in confidence that teachers are helping them learn more in reading, down 17.5% (Denver Public Schools, 2019). According to the Family Satisfaction Surveys in 2019, students' ratings of their enjoyment of school went down by 18%. These drops were reported from previous years of the same survey at the same schools (Denver Public Schools, 2019).

When considering the students themselves as a social context for the research, it should be noted that much of the previous research has been conducted for older students. Specifically, from different generational cohorts such as Millennials or Generation Z, students born in 1984-1996 and 1997-2010, respectively. While these generations may have been the first users of adaptive algorithms pioneered in social media, Gen Alpha students are accustomed to hands-on technology and interactive controls (EEA, 2019). In a 2020 study, Small et al. studied the brain health consequences of digital technology use and examined its effects on brain development. According to their research some digital tools may increase brain neural activity, improve memory, multitasking skills, and fluid intelligence. They also acknowledged potential harmful effects of overexposure to screen time and technology such as heightened attention-deficit symptoms, disrupted sleep, social isolation, and impaired emotional and social intelligence (Small et al., 2020).

Based on these contexts, social expectations are likely to adapt, or may have already, expecting personalized, adaptive, and hands-on experiences everywhere, creating a disjointed experience when learning environments, or workflows, do not follow the same workflows. In a qualitative study of 32 students, Weninger (2018) reported educators considered edtech enhanced learning environments to include pop-culture references of songs with multi-media, PowerPoint presentations, and other technologies based on entertainment. Students in this study expressed a desire to have technology as a tool to assist in learning concepts applicable outside the

classroom, rather than just to entertain them. In a recent study of educators, only 46% were positive and optimistic about personalized learning (Education Week Research Center, 2019). This is an incredible departure from social and industry norms; it is estimated that businesses adapt to technological advancements three times faster than education (EEA, 2019). With communities and students expressing a loss of confidence in the application of learning and disengagement at problematic lows, educational systems are also reporting high teacher turnover citing behavioral problems from actively disengaged students as the reason for leaving the profession (McCarthy et al., 2016). The gap of expectation versus reality of edtech enhanced instruction must be better understood through research studies in order to allow educators and students to find common ground by which to operate and hopefully raise engagement, positively affecting grit, and improve academic achievement, or at the very least, academic productivity.

Theoretical Context

Studies have been conducted to understand how educators and students perceive edtech within learning environments and as a support to enhance instruction. Additional studies have been conducted regarding motivation, achievement, and grit (Bozgun & Akin-Kostereliglu, 2021; Hodge et al., 2018; Muenks et al., 2018). Experiential learning has also been studied in the context of engaging student environments (Kolb & Kolb, 2009). However, most of the studies have been conducted with high school students (Hodges, 2018; Muenks et al., 2018; Purcell et al., 2013; Weninger, 2018) or with college-aged students (Hodge et al., 2018; Visual Academy, 2022). Researchers Bozgun and Akin-Kostereliglu (2021), studied primary school students' reading-writing motivation factors as it pertained to academic grit and subjective well-being. Results found these factors important for academic achievement, but more research is needed to add validity to the body of work, suggesting that motivation related higher than grit alone as

means to improve academic achievement. Some recent studies have found inconsistencies with grit theory as a singular theoretical context to support academic achievement, while others recommend a refinement of the grit scales (Credé et al., 2017; Muenks et al., 2018). Credé's analysis of grit comprised of perseverance and passion was examined with the assumption that passion relates to consistency of interests and found self-efficacy to be a stronger predictor of grades than grit components. This was also found true in a study of second to fourth grade students in mathematics instruction with explicit self-efficacy strategies (Koponen et al., 2021). My research is less focused on the academic achievement or how it is defined against end-of-semester grades and mastery of learning concepts as quantitative studies. It is more focused on qualitative research that seeks to understand if there are other perceptions characteristic of young students such as their view on edtech as a learning tool that influence grit ratings. This involves discovering if students feel higher grit when given edtech enhanced instruction according to their expectations. Based on the societal context and historical evidence, there is a gap in understanding grit theory in Gen Alpha students and assumptions or expectations they may bring to their learning environments that affect grit ratings. They may be more likely to persevere in situations where they have access to responsive, intuitive, or hands-on-screen experiences that mirror familiar structures prevalent in technology outside of the classroom.

Problem Statement

The problem is there is a difference in what elementary educators and grades 3-9 Gen Alpha students expect out of an edtech product in a learning environment and how students rate their ability to develop passion and perseverance towards long-term goals with edtech enhanced instruction. Some of these differences may be due to generational cohort differences that influence Gen Alpha's expectations for the workflow of learning based on the technology norms

in their daily lives. For example, if they are accustomed to a world that presents adaptive algorithms to learn new concepts in real-time as a typical technology interaction outside of the classroom, they may be easily disengaged, exhibiting low grit, when classroom technologies are not adaptive to learn new concepts, particularly if there is a delay or no feedback cycle that improves adaptivity.

In a recent generational study of sports edtech, researchers found that younger generations are characterized by a different model of consumption (Leszczynski et al., 2022; Werd, 2020). This included participating via personal screens rather than a shared screen and consuming non-live content three times more often in younger generations with a focus on emotional experiences tailored to fans (Leszczynski et al., 2022). Research needs to be done to understand the transferability of this study in learning environments of similar generations. In another study of Baby Boomers, Rogers stated that if Gen Alpha are the pioneers of new technologies, then Baby Boomers are the settlers (Rogers, 2009), arriving a little later with different intents on permanence and exploration. According to these studies, younger generations are increasingly disengaging with traditional options to consume content and industries and marketing strategies are shifting with twice as many resources dedicated to the new model (Leszczynski et al., 2022). This is consistent with McCrindle and Fell (2020) research on Gen Alpha. While much of their research is specific to Gen Alpha, they also considered consumption of a single technology over time to see how long it took to become common place by reaching 50 million users. It took 38 years for the radio to become a mainstream technology, 13 years for the TV, four years for the iPod, three years for the Internet, and only one year for Facebook (McCrindle & Fell, 2020). Pokémon Go took a mere 13 hours to displace its competitors, Candy Crush and Clash Royale, and only 19 days to reach 50 million downloads (Layland et al., 2018).

This means not only has consumption changed since the advent of the radio and the TV, but the younger generations that represent the learners continue to embrace new technologies at unprecedented speeds when compared to their teachers.

Purpose Statement

The purpose of this exploratory case study was to understand the expectations Generation Alpha (Gen Alpha), those born between 2010 and 2024, has on educational technology (edtech) in learning environments and how those students rate their grit with 12 participants in third through ninth grade. At this stage in the research, grit is defined as passion and perseverance towards long-term goals. In this research study, the focus will be on Gen Alphas using edtech in their learning environments.

Significance of the Study

As an exploratory case study of Gen Alpha learners, the significance is grounded in theoretical, empirical, and practical perspectives. Theoretical significance includes a closer look at the guiding theories by Angela Duckworth (2022) and David Kolb (2009) with their work in grit theory and experiential learning, respectively. Their original works have guided the research questions, underpinning the purpose of the study. The empirical significance will examine related studies and their similarities and remaining gaps that lead to this proposed exploratory case study. The practical significance, how the study might benefit future educators and administrators in enhancing learning environments through a better understanding of Gen Alpha learner expectations, will follow.

Theoretical Significance of the Study

The theoretical significance of the study is guided by grit theory and experiential learning theory to understand Gen Alpha learners with edtech in learning environments. This includes

using the 8-point grit scale developed by Angela Duckworth et al. (2007), the lead theorist of grit theory. Recent classroom studies have shown educators and learners may different expectations about edtech in learning environments and may develop grit differently as a result (Garavaglia et al., 2012; Januariyansah & Rohmantoro, 2018; Weninger, 2018). Technology studies conducted by marketing and other industries have found similar variances of what users expect out of technology as generational age brackets or cohorts such as Gen X or Gen Alpha (Cirilli et al., 2019; Leszczynski et al., 2022; Rogers, 2009).

Experiential learning theory maintains that learning is a process of creating knowledge through experience (Kolb & Kolb, 2009) and will be valuable in guiding and sorting what is learned through student observations and student interviews as they engage with edtech in the learning environment. According to Kolb and Kolb (2009), experiential learning is about giving the learner control over the nature and direction of their learning. Interview questions will be guided by both theories to understand what students expect out of technology and if it aligns with experiential learning expectations. The theory precedes many of the edtech products that are personalized, adaptive by response, and self-paced and this case study would represent additional data to the body of work specific to edtech.

Empirical Significance

Previous studies have largely focused on high school students (Hodges, 2018; Muenks et al., 2018; Purcell et al., 2013; Weninger, 2018) or college-aged students (Hodge et al., 2018; Visual Academy, 2022). Studies on Gen Alpha, the youngest named generation of twelve-years or younger at the time of this case study, have been conducted mostly outside of learning environments. The empirical significance of this study is addressing the gap between what industries know about Gen Alpha users of technology and what educational studies have learned

about behavior patterns in grit and experiential learning within learning environments. In a study of 32 students in a teacher reported technology enhanced class, students and educators defined the successful use of technology much differently from each other (Weninger, 2018). In this study, students did not feel they learned skills that applied outside of the classroom, citing that their teachers did not utilize technology in meaningful ways. A study by Adobe (2016) of approximately 1,000 high school students and 400 teachers, agreed they were not being adequately prepared for the real world. This study also explored differing impressions of edtech from educator to student, with educators citing an over reliance and an inability to have an original thought with its influence, while Gen Z learners said accessing other people's ideas inspired creativity and greater opportunities. Based on empirical evidence, there has been a difference in the perception, application, and execution of edtech within classrooms, but not specifically with Gen Alpha learners and the most recent adaptions of edtech within personalized, experiential learning environments. It is important to use this study to begin to understand if educators did not hold edtech in high regard because of its limitations and their own inexperience, and if Gen Alpha perceptions of edtech has changed as a result of these newer, more wholistic, solutions.

Beyond the gap specific to Gen Alpha with edtech, there are also gaps in how these learners interact in terms of behavior patterns that apply to self-rated grit and experiential learning. In a meta-analysis of recent studies, Credé et al. (2017) questioned the empirical validity of grit theory as passion and that additional exploration into understanding learners will add to the literature. Kolb and Kolb (2009) explored experiential learning largely without the influence of edtech and the lack of edtech experiential learning studies persists. A qualitative case study is appropriate to understand if students have edtech expectations specific to their

cohort and how they rate their grit in the presence of edtech that may or may not met their expectations, adding to the literature specifics to Gen Alpha learners with edtech and adding a new relevancy to experiential learning and grit theories.

Practical Significance

The practical significance of the exploratory case study is to provide evidence towards creating better edtech products towards student learning and to equip administrators with what gaps exist between their teachers and their students. The higher quality edtech products are available to enhance student learning, the more Gen Alpha specific needs can be addressed towards creating a better future with more relevant and applicable learning. Studies show that students have not been confident what they learn in school helps prepare them for their future (Adobe, 2016; Beck & Wright, 2019; Hodges, 2018; Weninger, 2018). As generational differences have been observed (Beck & Wright, 2019; Cirilli et al., 2019; Leszczynski et al., 2022; Werd, 2020), studies are needed to define Gen Alpha expectations of edtech before there could be a reasonable hope to change if they believe they are being prepared for their futures.

In addition to creating better edtech products that will help Gen Alpha students feel more confident their learning matters, there is also the potential to specifically support minority students of an urban district. As there is also a large minority population and an English Language Learner (ELL) population in the sites that may benefit from understanding more about how learners interact with Edtech and what supports may be needed to frame an educators' purpose for Edtech. Previous studies of ELLs suggest student autonomy and comfort influences student engagement in assessment (Chou et al., 2017). According to Chou, Edtech assessment supports improved student achievement. On a wider scale, this study might affect change in educator resistance to personalized instruction with Edtech, as only 46% were optimistic and

positive about personalized learning (Education Week Research Center, 2019). This could mean if the study supports that Gen Alpha learners expect personalized instruction with an edtech tool, educators may be more optimistic or positive about personalized learning. Administrators may also provide more professional development for their educators when they see the difference in student to educator expectations of edtech in learning environments. Some of the additional professional development may be related to the decreased satisfaction and confidence families have in teachers that may be based on COVID-19 protocols the schools put into place. Participants may express some of these influences while answering interview questions. These would be including with open-coding to gather these related answers as necessary.

Research Questions

The purpose of this exploratory case study was to understand the expectations Generation Alpha (Gen Alpha), those born between 2010 and 2024, has on educational technology (edtech) in learning environments and how those students rate their grit with 12 participants in third through ninth grade. As the first generation to be born entirely in the digital age, their worldview and experiences are likely shaped by technology experiences providing different social norms than preceding generations. As such, the research questions are meant to understand what social norms, or expectations, learners are bringing into the classroom. How students rate their grit will also be explored by guiding research questions.

Central Research Question

How do Gen Alpha learners describe technology expectations within their learning environments?

Sub-Question One

How is the development of 3rd-9th grade Gen Alpha learners driven?

Sub-Question Two

How do Gen Alpha learners interact with edtech?

Sub-Question Three

How might the social norms affect how Gen Alpha learners rate their grit?

Definitions

1. *Active student disengagement*—characterized by aggressive behavior that disrupts learning for themselves and others (Greener, 2018)
2. *Adaptive learning*—courseware, delivered digitally, that automatically adjusts the presentation of content based on the learning rate of the pupil (Plunkett, 2021)
3. *Blended learning*—Instruction that combines traditional face-to-face practices with elements of technology (Chism & Wilkins, 2018)
4. *Edtech*—the combination of technology as a tool and educational practices in classrooms (Frankenfield, 2020)
5. *Educational technologists*—variety-handler, someone that works in the educational institution but provides no instruction, instead is responsible for orchestration of educational and technical resources (Bardone et al., 2020)
6. *Educator*—someone who provides instruction to students in a traditional public-school setting
7. *Experiential learning*—Immersive learning experiences that promote learner control over nature and direction of their learning (Kolb & Kolb, 2009)
8. *Gen Alpha*—Individuals born 2010-2025 (McCrindle & Fell, 2020)
9. *Grit*—Grit is defined as passion and perseverance towards long-term goals (Duckworth et al., 2007).

10. *Learning environment*—places where people learn that include physical spaces, virtual spaces, or blended spaces that combine both physical and digital elements, providing a conducive space for learning (Williams & Clint, 2022).
11. *Passive student disengagement*—characterized by a lack of effort towards academics (Bond et al., 2020), specifically as a withdrawal seen in increased truancy or mental and emotional absence during learning
12. *Student engagement*—Indicates students' involvement in and enthusiasm for school (Hodges, 2018)
13. *Technology as a functional tool*—narrowly defined, technology as a tool is seen as tools to complete a task such as a computer, a Fitbit tracker, PowerPoint, Interactive Smartboards, cell phones, and other digital services (IGI Global, 2022)

Summary

The problem is there is a difference in what educators and Gen Alpha learners expect out of edtech products in a learning environment and in how learners rate their ability to develop "grit" which is passion and perseverance towards long-term goals with edtech enhanced instruction. The purpose of this exploratory case study was to understand the expectations Generation Alpha (Gen Alpha), those born between 2010 and 2024, has on educational technology (edtech) in learning environments and how those students rate their grit with 12 participants in third through ninth grade. It is also important to understand Gen Alpha behaviors or characteristics while using edtech that may be a result of their cohort's technology influenced social norms as they may affect how students rate their grit.

Gen Alphas experience constant personalization and adaptions in social media exposure, consumer habits, or even how they consume sports with responsive algorithms designed to create

a custom look and feel. Choices and patterns of behavior are consistently collected in their digital interactions through music choice, videos, advertisements, and AI systems with Alexa, Siri, and Google Assistant. As they have never known anything different, they may bring some of the same expectations to a learning environment when educators utilize edtech products. An incongruous experience from their daily life and learning environment may be the result of high disengagement reports (Hodges, 2018) and 2018 family satisfaction surveys (Denver Public Schools, 2019). Previous studies of grit support a positive relationship between grit, motivation, and academic achievement (Bozgun & Akin-Kostereliglu, 2021; Hodge et al., 2018), making the practical relevance of this study important for educators and administrators that are held to academic achievement measures.

CHAPTER TWO: LITERATURE REVIEW

Overview

A systematic review of the literature was conducted to explore the problem of the difference in edtech expectations in a learning environment between educators and Gen Alpha learners and how students rate their ability to develop grit. Recent studies have shown student disengagement is on the rise (Denver Public Schools, 2019; Hodges, 2018). Other studies have been conducted regarding motivation, achievement, and grit in high school or college-aged students (Hodge et al., 2018; Muenks et al., 2018; Visual Academy, 2022).

This chapter will present a review of the literature related to the study of edtech in learning environments and Gen Alpha behaviors and characteristics with technology outside of learning environments. Relevant theories include grit theory by Angela Duckworth (2022) and experiential Learning theorist, David Kolb. The later will be used to understand how Gen Alpha students behave in student-centric or experiential learning environments with edtech solutions. More must be learned to derive why students are disengaging and it may be due to generational cohort differences or to the widening gap of what educators versus learners expect of technology within learning environments. Lastly, related literature pertaining to student disengagement and teacher-centric models will be conveyed. There is a gap in the literature regarding the Gen Alpha cohort, or elementary students, in learning environments with edtech that makes this study viable.

Theoretical Framework

Grit theory will be the proposed foundational theory for the proposed exploratory case study of students utilizing edtech within learning environments. Grit theory, by prominent theorist Angela Duckworth (2022) sought to understand why some individuals make use of a

small portion of their available resources, “while a few exceptional individuals push themselves to their limits” (p. 1087). Some individuals use their network to reach beyond what they would have been capable of alone. Tang et al. (2019) define grit as consistency of interest and perseverance of effort. Similarly, Duckworth (2022) defines grit as working strenuously towards challenges and maintaining extended effort in the presence of failures, adversity, or the lack of consistent feedback.

Taking these similar definitions together, it could be said that grit is a personality trait (Tang et al., 2020b), specifically one that considers interests and perseverance towards life goals (Madigan & Curran, 2021;Tang et al., 2020a). A gritty individual is likely to finish tasks at hand and pursue a given course over many years. In early research, Duckworth (2022) noted that participants of her study were surprised by achievements of peers who did not seem as gifted as others, but those “whose sustained commitment to their ambitions was exceptional” (p. 1088). Previous studies suggest noncognitive qualities such as perseverance, self-confidence, and integration toward goals may be more predictive than IQ of success (Terman & Oden, 1947). As some research has linked grit with engagement and academic achievement and others grit as a significant contributing factor to academic achievement, it is important to consider with the current downturn of Gen Alpha engagement in classrooms.

Recent studies of grit theory, including a meta-analysis of grit literature suggest that grit is only moderately correlated with performance and retention, citing unbalanced criterion validities within the grit scales (Credé et al., 2017). Another study of 2,400 public elementary and middle students reported that gritty and self-efficacious students were rated as highly motivated by their instructors, but only those with higher self-efficacy were rated as more competent (Usher et al., 2019). In a study of sixth through ninth grade students with 747

participants, Tang et al., (2019) suggest grit is associated with increased engagement and academic achievement. However, Tang's study seems to be more about connecting engagement with positive academic achievement, and grit with engagement as an independent academic outcome. The practical implication of Tang's study is to encourage goal commitment more than growth mindset to increase grit. With the criticism of grit as both consistency of interest and perseverance of effort, there is still an abundance of evidence that suggests grit is associated with engagement. By this rationale, low grit may be a symptom of disengagement, rather than grit being a predictor of achievement.

Understanding Gen Alpha learner grit development and how that may be shaped by the prevalence of technology given the digital influence of these learners, the study includes student observations with an edtech product in their classroom. It is understood that individual interactions are not representative of the acquisition of knowledge, but rather that these interactions may represent the process of creating knowledge through learner experiences (Kolb & Kolb, 2009). Lehane, 2020, maintains learners should retain control over the nature and direction of learning for students to make their own discoveries. It is commonly referred to as student-driven or student voice in classrooms today where the student progresses at their pace through the learning, making decisions based on ability, capacity, or interest (Lehane, 2020). A student interested in horses rather than dogs may choose to read a grade level appropriate text based on their interest in horses. Grit theory suggests learners may be more likely to persist towards a long-term goal, such as improved reading comprehension or fluency, if they are able to choose interesting topics (Tang et al., 2020b). Popular reading curriculum companies have incorporated student choice through avatar creation (Learning A-Z, 2024), themes and backgrounds (Pearson, 2023) and award-point systems for progression (ABC Mouse, 2022;

Adventure Academy 2022). Others embed the student choice or interest at the start of a lesson and only allow students to play the game of their choice after correcting answers (Rivero, 2019). Study Island, an Edmentum reading and mathematics edtech software, allows students to pick which game category (puzzles, action, sports) and specific game to play within each category after correctly answering standards-based questions (Rivero, 2019). Edtech student-driven learning may also include consumption of the content through lectures, videos, or actively building or applying skills through 3D models or practice environments. Studies have shown increased engagement as students make their own choices from the onset (Lehane, 2020). As Gen Alphas are increasingly exposed to similar adaptive consumption models outside of the classroom, they may have the same expectations for educator chosen technology within the classroom. Failing to meet these expectations may be contributing to disengagement. Student interviews have been designed to understand how Gen Alpha learners' development of grit may be driven by their digital influences. Purposeful observations of students' experiences while interacting with teacher chosen technology may exhibit behaviors that verify the gap between expectations and reality.

Grit theory may provide clarity around Gen Alpha expectations of edtech products within learning environments and explore rationale for grit in the presence of edtech that may or may not meet their expectations. Technology-based learning solutions can promote the learner-centric model with adaptive algorithms that individualize both the content and the method of consumption based on student behaviors and feedback cycles. As a study, edtech tools may be positively associated with Gen Alpha engagement if Gen Alpha expectations are reflected in the technology.

Related Literature

As a part of the literature review that relates to this study, several subtopics will be addressed to explore the problem of edtech expectations that differ between students and educators. To begin, there are differences in how Baby Boomers and Gen X interact with technology when compared to Millennials, Gen Z, and Gen Alpha, born in part or in the full digital age. This includes within the roles of educators and students and in how each vary in the consumption of their technologies. A prime example of this difference is watching a live broadcast of news or a sports event on TV versus watching it on a personalized screen (tablet or phone) where it may not even be live or full length.

There are also prominent differences in expectations of learning environments, including student-centric models versus teacher-centric models, and a gradation of technology integration through a matrix. There is some related literature of a cross-section of these in edtech currently used in learning environments. These will be reviewed in subsets of literacy, and science, technology, engineering, and math (STEM) domains, assessment, and collaboration and play-based classrooms. As the problems persist, so also has disengagement of learners from their classrooms become more prominent. The disjointed experience from their lives outside of class and inside of class based on technology, or the lack thereof, is not direct cause of student disengagement, rather it is a symptom of their disengagement. Related research supports that edtech is closely related to student engagement, supporting the practical significance of the study to increase student engagement if educators and administrators were able to implement edtech in ways that Gen Alpha learners define as meaningful.

Different Expectations of Technology

The Pew Research Center (2021) reported that 93% of American adults use the Internet with 97% having a mobile phone. How they use it, whether to mediate conversations for work or health, or as a leisure tool for accessing information and connecting, seems to be dependent on age (Magsamen-Conrad & Dillon, 2020) or age, income, and education (Pew Research Center, 2021). Generational research through Rogers' (2009) focus groups of Baby Boomers suggests different generational cohorts have very different ideas of the permanence and recommended prevalence of technology. An example of this is when someone chooses to keep an older, unsupported phone rather than update it because it represents newness or change of technologies, regardless of cost. Likewise, there are some individuals who may eschew Ais such as Alexa, Siri, or Google Assistant for the fear that the technologies may unwittingly shape digital experiences, violate data privacy, or inadvertently begin to shape their choices through adaptive algorithms in marketing.

In a focus group of the Baby Boomer generation, participants believed too much technology led to technology shaping their lives rather than technology fitting into their lives to serve specific, known purposes (Rogers, 2009). A consistent theme in the group was that their generation brought their own worldview values to technology. Human rights and individual freedoms were historical markers that could be influencing their perspectives on technology as a result. In a review of digital skills across several generations, Cirilli et al., (2019) found similar themes, that the perception of its use is less positive compared to younger generations. Small et al., (2020) studied brain health consequences of digital technology use on brain development, finding potentially harmful effects and development benefits.

Social media is one of the larger differences between generations. As of 2005, only 5% of adults used at least one social media platform (Pew Research Center, 2021). That number has since grown to 72% of adults. The center only collects data on adults, using age brackets of 18-29, 30-49, 50-64, and adults aged above 65. This loosely represents the second half of Gen Z, Millennials, Gen X, and Baby Boomers, respectively. Gen Z adults have fluctuated between 84%-90% social media users over the last five years, while Gen X is 73% and Baby Boomers as low as 45%, half that of the younger generations. In reviewing the body of research of different expectations generations have for technology, there are several subsets of studies to be explored in greater detail. To begin, a subset of the data deals specifically with educators' and students' differences of purpose in using technology. This subset looks at the general theme that educators seem to choose technology to entertain students as a part of an anticipatory set, while students feel technology want technology to be chosen as a tool. This is followed by a review of consumption patterns according to generations or cohorts from the Silent Generation to Gen Alpha, led by industries.

Synthesizing the studies, the expectations, or behaviors each have of technology is meant to provide data of technology use by generational cohort and the expectations they have of technology in general. Further exploration will be reviewed of differences of expectations of edtech in learning environments, how edtech is utilized in learning environments to increase engagement or enhance instruction, with a culmination of Gen Alpha and classroom disengagement. This will be less about why students disengage and more on data that represents how many are disengaging and implications that occur as a result.

Roles of Educators and Students

As the age cohort of educators and students is examined, the age cohorts should be applied towards data of current educators. Eighty-six percent of traditional public-school teachers are over the age of 30, with nearly a third of them being over the age of fifty (National Center for Education Statistics, 2023), making Gen X and Baby Boomers the most predominate age cohorts of educators. Students can be loosely applied as Gen Alpha for elementary students, and the first half of Gen Z for high school students, based on common age brackets. Educators often appropriate technology as a medium to deliver content and to entertain students (Weninger, 2018).

In the study of 32 high school students, learners' expectation for academic success was disconnected from their belief that in-school learning provided authentic learning experiences through technologies (Weninger, 2018). This represents the difference is the purpose of technology amongst educators and students. Students critiqued how the technology tools were utilized, stating that learning environments utilizing technology chosen by their teachers did not connect to real-world applications. Gen Alpha is more commonly using technology as a supplement to their real-world activities, and not simply as something to entertain themselves (Beck & Wright, 2019). Students have also criticized technology integration as educators failed to master technology tools such as PowerPoint to effectively deliver content (Weninger, 2018).

According to researchers, teacher-centric models are characterized by defined content driven instruction and teacher facilitated discussions (Blundell et al., 2020; Reeves et al., 2017). They have not consistently been linked to an increase in engagement or improved achievement as student-centric models (Mackenzie et al., 2017). Educators in some studies failed to leverage

technology as a tool to integrate student participation, interaction, or feedback opportunities (Weninger, 2018).

In a U.S. national study by Adobe (2016) of 1,007 Gen Z students and 414 teachers of Gen Z students, the gap between student and educators on technology persists. When asked to list the differences between themselves and past generations, a Gen Z student said he believed his generation looked for smarter solutions to problems instead of long and tedious methods. Asked the same question, educators said that younger generations just wanted to be entertained and that the overuse of technology made it a hindrance for students to think without it. This follows the consistent theme that educators have a more negative view of technology than students. Gen Z learners name characteristics of their cohort things that could not exist without digital influences such as a greater variety of professional choices, interconnectivity, or access to information (Adobe, 2016) suggesting they define themselves within a digital space rather than apart from it. This further suggests the disconnect if technology is not used within classrooms. However, contrasting with this characterization of digital possibilities, teachers named a dependency on technology as a negative, specifically as something that has impeded logical thinking skills or encouraged too much social dependency through technology and not through in-person social skill (Adobe, 2016) and that technology in learning should not be utilized unless absolutely necessary and then only for advanced students (Liu et al., 2017). The inclusion of this early study is intentional as it represents a collective skepticism of educators using technology as the edtech field was first emerging. Despite educators recognizing that students in their classrooms loved technology, it was believed that weak students would be wasting their time on technology (Liu et al., 2017). It is important to recognize that when this study was collected, technology was considerably different than now, however many of the same technologies in

Weninger's 2018 study were referenced in 2007: PowerPoint, media tools, and access to information for students.

In a study with students engaging with collaborative learning edtech tools, it was said to facilitate multi-channel interactions among students and students with facilitators, giving richer knowledge from others (Mulyani et al., 2019). There were many differences in how educators and learners perceived technological influences.

Some educator attitudes towards technology tended to be negative (Liu et al., 2017), while other studies of the time students were largely enthusiastic about technology (Akman & Cakir, 2020; Attard & Holmes, 2020; Guerrero et al., 2004). The study also addressed a continuing theme seen in edtech literature that technology has been oversold to schools and then underused by its teachers. Attitudes towards technology included raised concerns technology may replace real learning or that technology may replace an educators' jobs when they were asked why they thought the oversold unused phenomenon had occurred (Liu et al., 2017). In a more recent study of more than 2,000 middle and high school teachers, 18% said digital technologies made teaching writing more difficult (Purcell et al., 2013). Some teachers in the study said they were open to incorporating technology but only if it "truly enhances learning and I am not aware of any technology piece that would do it better than what I am currently doing" (p. 57).

Generally, the term educator refers to those in charge of student instruction across a variety of subjects. Within this research, the term educator will apply to its commonly accepted definition. It should be noted, however, that there have been variations of this term by those typically outside of the education field and future research may need to be amended or built upon for clarification purposes as other fields use the term interchangeably with quite a different

meaning. There are some educators, such as many homeschooling parents of Colorado, that use the term *educator* to refer to an academic advisor that collects, plans, or organizes educational resources (My Tech High, 2022). The program is widely available, across all of Idaho, Indiana, Tennessee, Wyoming, North Dakota, Arizona, Utah, Florida, and Colorado. The program works with various edtech product vendors to establish a wide range of K-12 options for parents to choose from and then assigns an *educator* to each student as someone who can collect data, is available to advise on products against academic goals, and organize the resource offerings based on iterative feedback and data cycles. This assigned educator provides no instruction and rarely direct student contact, making it quite different from the traditional educator. Bardone et al. (2020) termed this role an *educational technologist* and is one who works in an educational institution as a variety handler, or someone responsible for orchestrating educational and technical resources.

Total Package Hockey (TPH) is another multi-state program that is officially a private school organization but has zero teachers on staff (Total Package Hockey, 2022). They employ educational technologists, though for marketing purposes towards parents they are still referred to as teachers and all students are part of classrooms. According to their website, there is one chief academic officer for the company with a few educational technologists spread throughout the sites, typically one per building despite up to hundreds of students (Total Package Hockey, 2022). As it is a sports program, coaches are often present in the room for classroom managerial duties, though all academic advising goes through the educational technologist and typically through student data collection rather than in person consultations. This means if a student is failing in fractions, the data systems would flag a need for further support on fractions and the educational technologist would populate fraction supports in the student learning paths

automatically. Further research in the expectations of parents of school-aged children should be considered to explore the possibility that students and parents may both be establishing expectations of edtech that affect satisfaction and engagement in traditional classrooms.

Technology Consumption Differences

Marketing and industries have spent considerable energies in tracking and understanding the behaviors of generations within cohorts to shift advertising campaigns, build new products, or adjust their industry to new consumer behaviors with technology. One example of this is news consumption. Television was reported as the main source of news for 76% of consumers over 55, while consumers aged 18-24 reported only 47% as television as the main source of news (Leszczynski et al., 2022). Television consumption of Gen Y and Z was 3.5 times lower than Gen X and Baby Boomers despite increased screentime overall. For sports consumption, younger generation behaviors included engagement by tailored experiences to individual fan preferences.

In a focus group of Baby Boomers and technology, Rogers (2009) noted that Baby Boomers primary reason for frustration was unnecessary complexity. Their solution: that every technology be simple enough to have instructions fit on a single page. By this definition, the prevalence of individual features based on consumer habits would be viewed as unnecessarily complex.

Cirilli et al. (2019) reviewed digital skills from the Silent Generation (1928-1945) to Gen Alphas. They found that technology consumption changed with nearly every generation. While Baby Boomers were perceived to have good knowledge of computers, tablets, and smartphones with 53% knowing how to use these, technology was not considered to play a central role in their lives, and they preferred to disconnect after using various technologies. In contrast, Gen Alpha prefer personal devices such as smartphones or tablets to computers, are quick receptors of

information, responding quickly to stimuli, are great digital multitaskers, and obtain information through hyperlinks rather than linearly. They prefer to interact, gather, and process information on personal devices that are increasingly connected (Werd, 2020).

The number of online hours decreases as age increases, with Gen Alpha organizing their lives with technology (Cirilli et al., 2019). Synthesizing these studies, Gen Z and Gen Alpha tend to consume digital content via personal screens rather than shared screens. If they come to classrooms with the same expectations this would represent a student-centric model that is responsive to their consumer habits. For educators that largely represent Gen X or Baby Boomer generations, they prefer to use technology on a large, shared screen. Their expectations would represent a teacher-centric model and is consistent with previous studies of educators using PowerPoint, large screens like interactive whiteboards to showcase multimedia content, or to engage a learner with consumable and relevant video content (Al-Balushi et al., 2020). The consumer habits and preferences based on generational studies demonstrates a continued gap in how educators and learners may come to learning environments with different expectations of how to use technology or edtech products. While consumer habits are valuable studies, it still does not answer what students expect out of technology in specific terms. They want what they learn in school to prepare them for a future after school (Adobe, 2016; Weninger, 2018). Nearly half of the 1,000 Gen Z students in Adobe's study agreed that what they were learning in school was most important for their futures. Fifty-eight percent believed what they learned outside of school was most important for their futures. As a case study of Gen Alpha students, my research would extend this body of work to apply to the most recent generation.

Differences of Expectations in Learning Environments

The initial related literature reviewed the different expectations and perceptions of technology in more general terms. Cohorts of consumers have different consumer habits of consumption while educators and learners had some opposing thoughts around the purpose of technology. There are additional studies on the differences of expectations in learning environments (Adobe, 2016; Beck & Wright, 2019; Blundell et al., 2020; Weninger, 2018). These include preferred teaching methods and preferred methods of learning. It will also address a similar theme: what educators think the impact of their instruction is does not necessarily match students' perceptions. The reason learning environments should be addressed as a specific body of research without regard to edtech is to lay the foundation for what may be causing these differences. For example, many educators used technology to entertain students and utilized the technology themselves as a teacher-centric model. Educator expectations in learning environments follow a similar teacher-centric pattern and according to educators; this is expected and appropriate according to educators. In the previous section it was also understood that older generations consumed technology in the same large, single screen model and preferred to watch sports and news live on TV. In the next review of the literature, we will examine how teachers continue to perpetuate this same consumer pattern, expecting students to consume content in the same way as them, rather than changing the model towards Gen Alpha preferences. The first subset to be explored of expectations in learning environments is about student-centric models and teacher-centric models, their characteristics, and implications. The second subset of expectations in learning environments will delve into subject specific expectations and methodology patterns.

Student-Centric Models and Teacher-Centric Models

Student-centric models and teacher-centric models represent opposing pedagogies of instructional practice within the classroom. Blundell et al. (2020), studied the student-centric model, also identified as the learner-centric model (Bandura et al., 1996; Kolb, 1984; Kolb & Kolb, 2009) was characterized by augmented reality, online collaboration, and skills learned through creative endeavors. In the study by Adobe (2016) both teachers and students expressed students learned best by doing and creating. Teacher-centric models are characterized by preselected content heavy instruction with teacher facilitated discussions (Blundell et al., 2020; Reeves et al., 2017). They do not account for or expect student collaboration with a measure of consistency but view it as a possible by-product of student participation. This may explain the discrepancy in how educators and learners each rated the frequencies of a set list of teaching methods within a classroom (Adobe, 2016). Educators rated collaborative learning at 32% while students rated the frequency of this method at less than half of what their teachers reported. What educators considered to be collaborative learning, was not what students considered collaborative learning. This could also be due to the difference in consumption models between groups. Viewing a large screen and discussing its content may be viewed by educators as collaborative while students' consumption behavior includes interacting with peers on personal interconnected systems. Further research is needed to understand this. By asking students about their expectations of edtech in learning environments through my exploratory case study, it may help to address why educators and learners seem to categorize the same experience very differently. Similar disagreements were seen in the frequency of listening as a learning method: teachers rated the frequency at 33% while students rated listening as the most used method at 57%. The difference of 24 percentage points is significant. Besides the difference in opinion of what

learning methods were utilized, 46% of teachers are not optimistic and positive of personalized learning (Education Week Research Center, 2019).

Educators that utilize a teacher-centric model rather than a student-centric model may mean a continued resistance of edtech products in learning environments. This may have a trickle-down effect towards student disengagement and their belief that what they are learning is relevant towards their futures. Technology might be used, such as teacher directed PowerPoint and Interactive Smartboards, but not edtech products, based on teacher comfort and consumption patterns. The difference to a Gen Alpha learner may be significant as technology refers to function and less to learning, while most edtech products are designed for learning as a journey, an adaptive sequence of experiences. PowerPoint is an example of technology as a function; a business tool that can be applied generally, not specifically. As a construct, this would be less aligned with an adaptive journey of learning and more a single data point of learning, though educators in Weninger's (2018) study said this represented their technology enhanced instruction.

Models that allow the learner to direct their learning with controls through a progression or a journey of experiences is more representative of a true experiential learning construct (Lehane, 2020; Martin, 2017). This includes the ability to alter a learning path with tools or controls (Chism & Wilkins, 2018; Martin, 2017). This model promotes student motivation and engagement that may lead to improved academic achievement (Kolb & Kolb, 2009). Technology as a function, rather than as a journey has been explored at length. It can be seen as a collaboration between students in modern learning environments (MLEs) to affect literacy engagement and achievement (Mackenzie et al., 2017). Student decision making authority in

their topic and context increases engagement and improves achievement (Beck & Wright, 2019; Blundell et al., 2020; Lehane, 2020; Mackenzie et al., 2017).

Blended learning combines traditional face-to-face classroom practices with elements of technology, such as giving students assignments to complete with Fitbit fitness trackers, applications, or exercise videos (Chism & Wilkins, 2018). It is among the most prominent methods of applying edtech (Bond et al., 2020). Practitioners of these methods identified greater chances of student success, flexibility, and personalized learning (Blundell et al., 2020; Chism & Wilkins, 2018; Mackenzie et al., 2017) and an increase in behavioral, affective, and cognitive engagement (Bond et al., 2020).

The Technology Integration Matric (TIM) provides a framework for describing and targeting five interdependent characteristics of meaningful learning environments as they are associated with five levels of technology integration: entry, adoption, adaption, infusion, and transformation. This table is used with expressed permission from FCIT, University of South Florida, 2023. This represents a matrix of 25 cells, pictured below:

Table 1

Levels of Technology Integration & Characteristics of the Learning Environment

LEVELS OF TECHNOLOGY INTEGRATION → / CHARACTERISTICS OF THE LEARNING ENVIRONMENT ↓	ENTRY LEVEL The teacher begins to use technology tools to deliver curriculum content to students.	ADOPTION LEVEL The teacher directs students in the conventional and procedural use of technology tools.	ADAPTATION LEVEL The teacher facilitates the students' exploration and independent use of technology tools.	INFUSION LEVEL The teacher provides the learning context and the students choose the technology tools.	TRANSFORMATION LEVEL The teacher encourages the innovative use of technology tools to facilitate higher-order learning activities that may not be possible without the use of technology.
Active learning Students are actively engaged in using technology as a tool rather than passively receiving information from the technology	**Active Entry** Information passively received	**Active Adoption** Conventional, procedural use of tools	**Active Adaptation** Conventional independent use of tools; some student choice and exploration	**Active Infusion** Choice of tools and regular, self-directed use	**Active Transformation** Extensive and unconventional use of tools
Collaborative learning Students use technology tools to collaborate with others rather than working individually at all times	**Collaborative Entry** Individual student use of technology tools	**Collaborative Adoption** Collaborative use of tools in conventional ways	**Collaborative Adaptation** Collaborative use of tools; some student choice and exploration	**Collaborative Infusion** Choice of tools and regular use for collaboration	**Collaborative Transformation** Collaboration with peers, outside experts, and others in ways that may not be possible without technology
Constructive learning Students use technology tools to connect new information to their prior knowledge rather than to passively receive information	**Constructive Entry** Information delivered to students	**Constructive Adoption** Guided, conventional use for building knowledge	**Constructive Adaptation** Independent use for building knowledge; some student choice and exploration	**Constructive Infusion** Choice and regular use for building knowledge	**Constructive Transformation** Extensive and unconventional use of technology tools to build knowledge
Authentic learning Students use technology tools to link learning activities to the world beyond the instructional setting rather than working on decontextualized assignments	**Authentic Entry** Technology use unrelated to the world outside of the instructional setting	**Authentic Adoption** Guided use in activities with some meaningful context	**Authentic Adaptation** Independent use in activities connected to students' lives; some student choice and exploration	**Authentic Infusion** Choice of tools and regular use in meaningful activities	**Authentic Transformation** Innovative use for higher-order learning activities connected to the world beyond the instructional setting
Goal-directed learning Students use technology tools to set goals, plan activities, monitor, and evaluate results rather than completing assignments without reflection	**Goal-Directed Entry** Directions given; step-by-step task monitoring	**Goal-Directed Adoption** Conventional and procedural use of tools to plan or monitor	**Goal-Directed Adaptation** Purposeful use of tools to plan and monitor; some student choice and exploration	**Goal-Directed Infusion** Flexible and seamless use of tools to plan and monitor	**Goal-Directed Transformation** Extensive and higher-order use of tools to plan and monitor

Using the example of PowerPoint as a technology in a learning environment, the educator is using the tool to deliver curriculum content to students. There is no adaption from one medium to the next, representing a copy-paste mentality. Timed math drills on paper replicated to timed math drills with a gamification graphic overlay is an example of the adoption level. The student

completes the same action in each case. Adoption level refers to the students using a conventional tool in procedural ways. Typing an essay rather than handwriting it is another example of this. The infusion level is when students begin to own the experience and is the first level in which experiential learning begins as students choose the nature of their learning by choosing the technology tool. Educators would state the learning objective and may give choice boards or options of technology tools to learn from. This may also include the use of adaptive edtech products to learn a new concept (TIM, University of South Florida, 2023).

The transformational level, the final level of technology integration, represents learning activities that would not be possible without the use of technology. As characteristics of the learning environment progress from top to bottom, the learning becomes increasingly open-ended and student centric. It would be interesting to learn where students' expectations, who are not typically exposed to this matric, lie within the matric. Open coding of student interviews, student questionnaires and student observations to divide data into themes may surface some of these cells. Grit, who addresses sustained interest and sustained effort (Duckworth et al., 2007), may also be increased as the characteristics of the learning environment become more complex. Student responses in seem to represent student expectations of technology as providing authentic transformation where students had wanted higher-order learning activities from technology to connect to real-world learning (Adobe, 2016; Lehane, 2020; Weninger, 2018). It also seems consistent with students that said they learned best by doing and creating and believed what they were doing outside of the classroom was more useful for their future careers (Adobe, 2016). However, the TIM matrix does not seem to allow for sustained interest as equally as sustained effort.

This model promotes student motivation and engagement that may lead to higher chances of academic achievement (Lehane, 2020). This is consistent with a survey of 1,007 Gen Z learners, aged 11-17, where learners said they learned best from doing or creating (Adobe, 2016). Teachers in the study responded with nearly identical numbers in this question but had very different answers from students when asked about which teaching methods were used most frequently. Educators felt that writing (42%), listening (33%) and collaborating (32%) were the most frequent teaching methods to Gen Z students, while Gen Z students with the same question responded that listening was the most frequent at 57%, a difference of 24 percentage points. Collaboration according to students was less than half of what teachers said was a frequent teaching method. Synthesizing this information, both educators and teachers felt student-centric models were best for student learning, but had very different interpretations of what teaching methods actually taken place. This may be due to a difference in opinions of what a teacher assumes an edtech tool will do versus what a student thinks of the same tool as seen in other studies (Li, 2007; Weninger, 2018).

Edtech with younger ages may be an iterative process to create transformational pedagogy and learning environments (Reeves et al., 2017). Feedback sessions transformed the learning model from teacher-centric to student-centric by allowing for student direction in future technology tools. Teacher led discussions encouraged the young students to discern between learning applications that promoted instructional growth and those that were entertaining and most preferred by students. This practice enhanced technology as a tool for performing new tasks and confirming learning objectives. Researchers identified some learning applications primarily delivered student entertainment. However, while they increased engagement, they did not promote academic achievement (Reeves et al., 2017). This supports the idea that edtech is a tool

and like most tools, they can be used for building or for tearing down and educators should discern the purpose of a tool prior to implementation.

Overall, there are clear differences in how educators and learners expect edtech to surface student-centric or teacher-centric models that further represents there are varying expectations about Edtech used in the classroom. As a qualitative study of Gen Alpha learners, my case study seeks to identify expectations Gen Alpha students have about edtech and how they rate their sustained interest and sustained effort. This will extend the literature from what many studies have demonstrated about Gen Z with slightly older technologies to include Gen Alpha with more enhanced edtech available today. As an experienced edtech designer, I am aware of the significant enhancements that the market has produced in edtech within just the last two years.

Edtech in Learning Environments

Now that the differences have been reviewed in expectations and perceptions of educators and students in technology from a generational consumption perspective, edtech as it represents experiential learning, and characteristics learning environments in the literature, it is important to examine more specific examples of edtech within individual classroom components. Like tools that might be found in a toolchest, edtech products are created for specific purposes and do not often transcend across multiple solutions. A hammer might work to bang in a screw, but it does not work as well to get the job done as a screwdriver might. In the same way, some edtech solutions are designed for assessment with question and answers in sets for students to progress through. An example of this is Study Island by Edmentum. It does not contain components for learning, though my work at ACT revealed some researchers believed in the validity of students answering questions on skills they had not learned to learn from their wrong answers. Much of the research dedicated to learning from errors is a decade old and would

benefit from current studies with the much-changed generation of learners, however, there are some studies that suggest productive failure in certain situations. Loibl and Leuders (2019) conducted a study of three groups of students who took an assessment and received feedback: Providing only correct solutions, correct and incorrect examples, and providing comparison prompts to correct their solutions. The group that saw correct and incorrect answers and were specifically instructed to compare to correct their solutions significantly outperformed the other groups. However, as a designer of many edtech products and a researcher of many more, this researcher can comfortably attest that the corrective feedback provided is not designed in congruence with consumable feedback according to what we know about Gen Alpha learners. In other words, text-based feedback is common to correct answers, but this is not how Gen Alpha learners have been known to interact or respond within edtech products. They prefer to consume video content, pictorial demonstrations, or many other forms of multimedia. The previous studies of the benefits of corrective feedback need to be reevaluated for validity against the well-researched consumption patterns of Gen Alpha learners. In summary, there may be some progress that occurs within an edtech assessment product, but not nearly as much as finding the screwdriver to drive in the screw. Along the same analogy, being told the hammer was wrong would not have the same benefit as doing a comparative analysis of how well a hammer worked versus how well a screwdriver worked to screw in a screw.

A core math or literacy curriculum product may be designed with multiple components and a multifaceted intent across content. Content is delivered within collaborative instruction, play-based learning centers, and assessments and may be comprised of many smaller edtech products. Within each specific solution, edtech products have been associated with affecting student achievement. The purpose of these subsequent sections is to understand that while

educators may continue to be resistant to edtech as a generation (Cirilli et al., 2019; Rogers, 2009), there is an abundance of evidence that edtech designed for specific functions and used for those functions have positive effects on student engagement and student achievement.

Literacy learning & Science, Technology, Engineering, Mathematics (STEM) learning

The problem that educators and students have different expectations of edtech in learning environments can be divided into specific subject areas. Literature supports that edtech and technology both support increased academic achievement in literacy and STEM learning. According to Colliver et al. (2019), Early Childhood Education (ECE) apps represent a large part of children's learning experiences. They also found that app developers focus more on entertainment value per stakeholders (parents and children) interest with learning being self-evident to repeat usage or iterate app development towards learning purposes. While this case study seeks to learn what expectations Gen Alpha students have about edtech, there are many studies that there are educators that expected no academic achievement or students to be distracted by technology. There is some research that supports potential harmful effects of too much screen time (Horowitz-Kraus & Hutton, 2018; McDonald et al., 2018; Small et al., 2020). Overexposure to screen-based media seems to be a factor rather than a predictor of heightened attention-deficit symptoms, disrupted sleep, social isolate, and impaired emotional and social intelligence (Small et al., 2020). Horowitz-Kraus and Hutton (2018) found increased screen time in conjunction with decreased time spent reading affected language development. McDonald et al. (2018) found increased screen time for infants to age two a factor for delayed social-emotional development and behavior problems. Together these neuroscientists and researchers support teacher theories that too much technology may lead to distracted learning, at least in part. There is still evidence for benefits of prolonged screen time. Small et al., (2020) reflected on

positive development as well with an increase in brain neural activity, improved memory, improved multitasking skills, and fluid intelligence.

Student-centric models occur across instructional disciplines, sometimes fluidly throughout the day, for literacy, science, technology, engineering, and mathematics. Literacy learning practices that are student-centric and based in real-world application of future and current technologies have higher academic outcomes for literacy instruction (Herodotou, 2017; M. Neumann, 2018; Weninger, 2018). Pre-school learners found technology tools easier for navigation in general, increasing accuracy, completeness, and reaction time (M. M. Neumann, 2018). While grit is difficult to ascertain in learners that are so young, we do know that grit is sustained effort and sustained interest (Duckwork et al., 2007). According to M. Neumann (2018), preschoolers were able to sustain effort when using tablets. This may be a result of using something that was a familiar interface. The study did not include information on participants' prior knowledge. This would have clarified if students were merely more engaged by using the tablets, or if they were able to sustain effort more if they had prior experience with tablets.

Similarly, science simulations and virtual laboratories have been shown to promote learning gains among STEM environments. Pre-schoolers had improved post-knowledge science test scores when they used tablets (Furman et al., 2019). Their ability to integrate technology in accessible and increasingly digital simulations, with more interactivity shows growth amongst an array of modalities according to Scalise et al. (2018). In a quasi-experimental mixed method study, Fabian and contributing researchers ascertained mobile technologies in mathematics learning environments improve student attitudes and academic achievement through Math Test (MT) scores (Fabian et al., 2018).

Similarly, Schacter and Jo (2016) found that low-income students in kindergarten with inadequate math knowledge were able to learn significantly more than control groups when using edtech, a tablet-based curriculum product. These students improved early number skills over the course of one year at a rate of 1.1 while the control group represented 1.0-, or one-year's growth.

In each of these studies there is a statistical significance between the technology enhanced learning and traditional learning methods. Students in STEM classes utilized technology primarily as tools for understanding and interacting with materials. Literacy classes leveraged technology as a way for students to interact and collaborate with their peers. Both scenarios allowed for a learner-centric model that promoted student ownership of tasks, utilizing tools as necessary rather than as directed. This strategy is in favor of experiential learning theory which promotes the ability for students to drive their own academic choices to enhance motivation and positively influence knowledge retention over time.

Assessment

As a component of edtech strategy, assessment systems have been studied for their ability to provide timely, relevant data to educators to adapt instruction. An early 2000s awareness of the lack of assessment systems capturing or tracking student data (Breiter & Light, 2006; Means et al., 2009), resulted in an explosive growth of edtech assessment products (Jennings et al., 2020). Assessment systems become increasingly complex with educators able to pull several reports for their students, including advisable ways to group student's post-test. Unfortunately, studies revealed that educators continued to engage with systems sparingly (Jennings et al., 2020). There was high utilization at the time of testing, tracked by login data, and very inconsistent subsequent logins to access a limited number of reports around testing windows.

More than 75% of educators logged on five or fewer times, according to the researchers. It is not clear within the study if this was per testing window or total for the year. As many schools employ three testing windows or more, five or fewer logins would suggest teachers logged for an initial test set up, and once per testing window and may not have used any of the data to adjust instruction. Lengthy time for data review and introspection of assessment results is not a new problem. Franklin and Smith (2015) found alternative methods of data review to significantly reduce the time required and management of assessments by using iPads for assessment. Regardless of the time it takes to administer assessments or review the results, assessments are primarily designed to adjust instruction in the classroom, rather than to record student progress, (Jennings et al., 2020) though both are commonly available within edtech assessment products. Said another way, technology alone will not improve poor teaching and thoughtful changes must take place (Martinez & McGrath, 2014). Otherwards it might be considered the equivalent of hammering screws to hang shelves without bothering to use a lever and hope the cans of soup stay put.

There are some schools utilizing edtech assessment aids that are more about the student experience of assessment. Schools implementing Bring Your Own Device (BYOD) strategies for assessment reported higher academic gains for students' learning experiences (Chou et al., 2017). According to the study, students were more comfortable using designated learning applications with tech help features than utilizing print help materials. This further suggests student autonomy and comfort influences student engagement in assessment and a preference of consumption. English language learning students and students less likely to participate verbally both benefit from digital assessment tools while also promoting a student-centric model that increases grit by allowing students to maintain sustained interest, in using tools that suit their

current need, and sustained effort. However, these represent a departure from grit theory in that it pertains to short-term sustained effort, rather than long-term goals.

Collaboration and Play-Based Classrooms

Edtech strategies apply beyond assessment strategies to collaborative and play-based environments of young elementary students. In a play-based classroom, characteristic of preschool and kindergarten classrooms or Montessori classrooms, educators utilized an iPad to support emergent literacy and playful storytelling through collaboration (Fantozzi et al., 2017). The learning environment was designed to replicate the real-world based environment perceived by the researchers; young children were exposed to technology regularly through various mediums, fluidly transitioning from digital to print experiential learning and back again throughout the day. The digital collaborative element afforded cocreation and dramatic role playing. Fantozzi et al. (2017) reported an increase in engagement and student to student interactivity amongst Gen Alpha students with the edtech collaborative tools. This experiential learning design resulted in more sufficient literacy awareness and characterization, the academic goal of the lesson. In a study with students completing activities via edtech with non-human interactions, working on these exercises yielded significant results in improved learning outcomes (Ulfa & Fatawi, 2021). An experiment with students on game-based learning showed significant improvement in academic achievement and reduced students' cognitive load (Ulfa & Fatawi, 2021). Play-based models afford technology as a tool for instructional practice, rather than to entertain a student. Collaboration through technology continues to incorporate learner focus as it encourages student feedback and interaction between peers and between the content and the student. Each of these enhance the classroom environment through experiential learning,

the method of learning through a process of acquiring knowledge rather than a static delivery (Kolb, 1984; Kolb & Kolb, 2009).

Age-related transfer of knowledge, as it relates to a child's prior experience with types of media, may be associated with the effectiveness of play-based and collaborative classrooms that leverage technology tools. Students with no prior knowledge with interactive media such as video chats and digital games had correlational findings according to a study of two- and three-year-old toddlers (Kirkorian, 2018). In a randomly assigned, experimental study in two-year-old's, students were given several weeks of training with interactive digital tools. The naturalistic experience with interactive media may "help children recognize the symbolic nature of video screens enabling them to succeed on learning tasks that use symbolic media" (Kirkorian, 2018, p. 212). Regardless of age, students' prior knowledge of digital tools may affect the knowledge transfer and should be considered prior to implementation.

Gen Alpha and Classroom Disengagement

Synthesizing a body of literature for the purpose of understanding Gen Alpha expectations of edtech in learning environments includes understanding how they utilize technology through consumer habits, expectations they have of learning environments, and how any of these many be incorporated when they consider their grit towards learning. Research supports Gen Alpha students prefer to consume content on personalized screens through adaptive systems at a much greater rate than any previous generation, may expect similar experiential learning classrooms in congruence with their daily screen time patterns, and prefer edtech to provide fuller experiences than single data points. However, as the literature review evolved, it became painfully obvious that there are a significant number of teachers who not only do not use edtech in the same patterns as Gen Alpha students expect, but some are also significantly

opposed to technology (Adobe, 2016; Li, 2007; Purcell et al., 2013). According to the survey of more than 2,000 middle and high school teachers, nearly 90% of teachers believe that edtech was creating an easily distracted generation with short attention spans. Sixty percent said it hindered students' ability to write and communicate face-to-face with 50% stating that edtech hurt critical thinking (Purcell et al., 2013). Contrasting studies have shown that Gen Z students do well in collaborative learning, with social learning tools and instant communication platforms engaging them (Cilliers, 2021; Liu et al., 2017). Gen Alpha are more inclined to engage in activities that allow for networking (Beck & Wright, 2019). In the same study, researchers found that Gen Alpha is accustomed to information overload as a natural part of their day and choose to write short, concise content to cut down the noise. This suggests that what teachers perceive as poor writing or writing missing critical thought is an intention choice of brevity by learners. While it seems to be a small representation of the literature, it suggests a common theme in that educator and students' expectations and definitions are incongruent with each other. Similar studies on Gen Alpha need to be conducted to see the progression, if any, towards these preferred learning methods and incongruencies. As previously stated, industries have found Gen Z and Gen Alpha are some of the most interconnected consumers, engaging digitally with others of the same interests through mobile applications (Leszczynski et al., 2022). What educators discern as the ability to communicate is centered around a specific mode of communication: face-to-face. Perhaps it would be more accurate to state that 60% of educators in the Purcell et al., (2013) study believed technology hindered students' ability to communicate in the same way as educators. Or that the digital generations are less about traditional communication and more about interactions (Du Plessis, 2011). In terms of created more distracted learners, other research suggests that experiential learning through edtech creates an immersive experience, involving

complete absorption in each task, leaving no room for distractions with improved student attitude, engagement, and performance (Subhash & Cudney, 2018).

Given the sometimes-aggressive refusal of using edtech in learning environments by teachers with reasons that they like to see learning on pen and paper or are not aware of any technology piece that would do better than what they currently do, it is no wonder students are disengaging based on the disruptive experience from their tech influenced lives to anti-tech classrooms. In fact, in a national study by Gallup of students (Hodges, 2018), 46% of students were disengaged. The study revealed that in high school, engagement was as low as 32%. The study differentiated between not engaged and actively disengaged, with high school students ranging from 26%-32% actively disengaged (Hodges, 2018). According to other researchers, passive disengagement is characterized by a withdrawal of themselves, physically and cognitively, meaning they may not attend class and if they do, they are mentally elsewhere, with emotional absence and passivity (Bergdahl et al., 2020; Greener, 2018). Active disengagement is characterized by aggressive behavior that disrupts learning. It is also one of the top factors mentioned by educators in exit interviews when they leave the field of teaching (McCarthy et al., 2016). According to the study, 33% of US teachers leave the teaching field and change to alternative careers within the first three years of teaching. Burn-out studies of all observed professions has been conducted and teachers comprise nearly 30% of those that have left the field. Student misbehavior is one of the factors with another being that the gap between the lowest achieving child and the highest achieving child is insurmountable. Edtech can mitigate this gap by providing personalized interventions to the outliers of the classrooms and allow educators to focus on more on-level instruction.

Synthesizing the data, nearly half of teachers do not feel positive or optimistic about Edtech and nearly half of students are disengaged in the classroom, despite many studies representing those educators and student both believe the best learning occurs when they are creating or doing, often through edtech. With many remaining teachers seeming to miss the mark of what students expect of technology in terms of consumption and in experience towards learning, some allowances may need to be given towards students' ability to sustain interest and effort, or in how they rate their grit when they have already been sorely underserved. In further research, it will be imperative to understand if part of students' expectations towards edtech in learning environments has been negatively influenced by teacher's more negative attitude towards what Gen Z considered as some of their greatest assets as a generation. Gen Alpha may be increasingly disengaged due to a stronger reliance on technology.

Student disengagement on its own can be attributed to poor academic achievement (Bond et al., 2020). Disengagement is associated with low effort towards academic endeavors. According to both studies, disengagement may occur more frequently within poorly designed technology pedagogy. Greener (2018) suggests improving engagement requires an integrated approach to concentration, interest, and enjoyment and can be accomplished with edtech in games-based learning. Here edtech becomes part of the solution, rather than the problem of student disengagement. Student disengagement is defined as students that lack active participation, including but not limited to, low interaction between peers and faculty, and effort within the classroom (Bergdahl et al., 2020; Bond et al., 2020; Greener, 2018). According to a study involving 34 students by M. Ioannou and A. Ioannou, technology-enhanced learning experience from the learners is characterized by real-world enactments and an appropriate "intersection of technology, design, and pedagogy" to produce student engagement (Bond et al.,

2020; Ioannou & Ioannou, 2020). Student engagement is defined as “improved achievement, persistence and retention with disengagement having a profound effect on student learning outcomes and cognitive development” (Bond et al., 2020, p. 3). It is also characterized by the energy and effort learners employ within their learning environment. As researchers have found positive correlations between grit, motivation, and achievement (Hodge et al., 2018) and others have found motivated students to be highly engaged (Gares et al., 2020), the opposite may be true and student achievement may be on the brink of record downward trends.

Increased Motivation with Edtech

Liu et al. (2017) increased motivation occurs when edtech utilizes networked creation activities and dynamic pairing or grouping. Similarly, role playing and play-based edtech also increases engagement in kindergarteners (Aguirre-Muñoz & Pantoya, 2016). In their study, researchers identified the frequency of three types of engagement: behavioral, affective, and cognitive. Engagement increased during hands-on, and technology enhanced read-aloud across three ability levels (high, average, low) present in the study. In the study, teachers participated in a two-day training session to emphasize engineering instructional intervention with technology-enhanced tools. Students watched short video segments and were encouraged to utilize various media tools for creative responses used as an intervention or departure from the students’ normal academic routine. A decrease in engagement was observed immediately following the removal of the intervention, the technology-enhanced portion of the lesson.

Summary

From the literature, Gen Alpha and educators likely have different expectations on edtech in learning environments. There is existing research on Gen Alpha technology consumer patterns that are very different from Gen X and Baby Boomer consumer patterns. Early classroom studies

have been conducted as edtech was an emerging field to understand educator impressions and intentions of integrating technology into instruction. While there were some that embraced this new way of teaching, most of the studies showed educator resistance or a lack of confidence in the validity of technology as a learning resource. While educator research is not the focus on this proposed case study, it is relevant in establishing what teacher expectations are of edtech to understand the gap in student expectations of edtech. However, more recent literature is needed as fewer studies have been conducted in recent years, during which the edtech field has grown tremendously. Adobe conducted a study of educators of Gen Z students, including some elements of edtech in the classroom (2016) and others more closely related to impressions of technology on Gen Z and Gen Alpha. Typically, educators are more pessimistic about technology in general than their students and the effect it may be having on students raised in the digital age. These include the belief that an overuse of technology has led to a distracted generation that has a shortened attention span and a decreased ability to communicate. It is important to note that industry reports indicate Gen Z and Gen Alpha generations tend to be more connected than their predecessors and communicate with interest-based peers frequently in consumer habits. Also of note, is that there is evidence that Gen Alpha in particular processes much faster, discerning quickly, consuming content in nonlinear ways, which means it may not be as much about a reduced attention span as it is they simply do not need as much time to process the information. This indicates a gap in the understanding or perspective of the concepts. Educators may not realize that digital generations are communicating but communicating differently and in ways educators do not consider to be as valuable or that they do not perceive represents communication. It could also be said that the reverse is true in the perception of learning environments: learners reported educators did not often use certain teaching methods

with the same frequency as educators reported. Each side is coming to the classroom with a different set of values and beliefs about technology and about what constitutes various teaching methods. This makes it imperative to understand what expectations Gen Alphas might have about edtech in learning environments (RQ). Understanding those expectations may help to understand what is driving their grit determination (SQ), and to learn common behaviors and characteristics they have with experiential learning with edtech (SQ). There is simply not enough literature on Gen Alpha to understand if generational studies of technology transfers to how they learn or expect to learn inside of a classroom with technology designed around learning experiences, coined as edtech. The results of this research study will enable more effective edtech products to be designed and may enable education leaders to be better equipped with the research that could close the gap between educators and their learners, reducing the epidemic level of disengagement in classrooms. Student disengagement is one of the leading factors stated by educators as why they leave the field within the first five years (McCarthy et al., 2016), meaning this study may also help mitigate teacher turnover. Overall, the purpose of this study is to understand what expectations Gen Alpha has on edtech in their learning environments, and how they rate their ability to sustain effort and sustain interest towards long-term goals.

CHAPTER THREE: METHODS

Overview

The purpose of this exploratory case study was to understand the expectations Generation Alpha (Gen Alpha), those born between 2010 and 2024, has on educational technology (edtech) in learning environments and how those students rate their grit with 12 participants in third through ninth grade. The qualitative research approach of a case study will help to understand perceptions students have of learning environments through student observations, qualitative questionnaires, and student interviews. Research questions support related interview questions for learners in grades third through nine grades, in-person, or participating remotely. The research paradigm is pragmatism to evaluate students in a natural setting while doing their homework in a typical, at-home setting. Participants are 12 students in grades third through ninth. A central research question addresses edtech expectations of Gen Alpha learners with three sub-questions to understand what drives the grit of these learners, what the social norms may exist for these learners that may affect how they rate their grit, and what behaviors and characteristics of these learners are while using edtech. To address the first research question, participants complete an 8-point grit scale at the beginning of the study. Student interviews are conducted next and include questions related to social norms and expectations of edtech. Student observations are the final data collection to observe learner behaviors or characteristics with memoing and open-coding of these organized into themes. Pseudonyms are used to protect the identity of students and parents. All data are carefully examined for credibility, transferability, dependability, confirmability, and with ethical considerations to represent the facts of the study with appropriate synthesis towards conclusions that could be supported through similarly conducted studies. A chapter summary concludes this chapter with a goal of clearly depicting the

study in a way that it could be reproduced with similar results to add to the body of literature for learners with edtech.

Research Design

A qualitative study was appropriate to understand the expectations of edtech that Gen Alpha may bring to their learning environments and how they rate their grit. A qualitative study allowed me to better represent students' perceptions with open ended interview questions and observations. The goal was not to determine causation or academic achievement between edtech and grit, but to understand them separately. Gen Alpha learners may interpret their grit based on technology influences or social norms steeped in technology. These would influence the expectations Gen Alpha students have of edtech, while not being a direct predictor of higher or lower grit. Each represent components that are present in Gen Alpha learning environments that may be unique to their generational cohort.

According to Yin (2009), a case study illuminates a decision or a set of decisions, why decisions were made, how they are implemented, and with what result. In this case study, the decisions examined are the interactions with edtech as it enhances their learning environment. To see how those interactions are implemented, I used open coding to observe their behaviors with edtech. Results were seen in their ability to sustain effort or interest, or in their engagement. As an example, students described challenges and advantages of technology in class and outside of class and any expectations they have of technology. As an exploratory case study, I aimed to answer how or why questions with little control over the events of the classroom. It focused on phenomena within real-classroom situations. A case study was chosen for its ability to observe, conduct interviews, and collect questionnaires. The unique strength of case studies allowed for a full variety of evidence (Yin, 2009).

The exploratory case studies provided a flexible framework, ideal for immediate practical problems that is intentionally connected to previous research (Casula et al., 2021). The exploratory case study was used because it allows discovery of ideas and insights of the Gen Alpha students. These students were born during a time 2010-2025 when digital tools have always existed. This researcher is aware that there has been student disengagement with edtech but no explanation when these students are the true digital natives. It also promoted discovery of social norms that may impact grit development and scoring of Gen Alpha students while using edtech.

Research Questions

The purpose of this exploratory case study was to understand the expectations Generation Alpha (Gen Alpha), those born between 2010 and 2024, has on educational technology (edtech) in learning environments and how those students rate their grit with 12 participants in third through ninth grade. As the first generation to be born entirely in the digital age, their worldview and experiences are likely shaped by technology experiences providing different social norms than preceding generations. As such, the research questions were meant to understand what social norms, or expectations, learners are bringing into the classroom. How students rated their grit was also explored by guiding research questions.

Central Research Question

How do Gen Alpha learners describe technology expectations within their learning environment?

Sub-Question One

How is the development of 3rd-9th grade Gen Alpha learners grit driven?

Sub-Question Two

How do Gen Alpha learners interact with edtech?

Sub-Question Three

How might the social norms affect how Gen Alpha learners rate their grit?

Setting and Participants

Participants in this study were students who are enrolled in 3rd-9th grades. Enrollment was expected to be predominately white for in-person students based on neighborhood school demographics (National Center for Education Statistics, 2023). Participants were likely be 50% remote and 50% in-person. They were observed and interviewed in a home learning environment, a natural setting where they completed homework.

Site

The site chosen for the research study was an suburban neighborhood in northern Colorado. The practical implication of the exploratory case study was to apply understandings about how students engage with technology in the classroom in order to equip parents to make the best educational technology decisions for their students in the future. The results may also equip parents to make more informed purchases of edtech products, specific to their child's findings.

Participants

Research participants were intermediate students in grades 3-9 from a suburban neighborhood in northern Colorado or from schools outside of Colorado if participating remotely. According to the reported information, 51% of the local students were female and 49% are male. Participants included students that are proficient with edtech components; this experience was not a prerequisite of participation in the study. Some participants may have

experienced learning loss or decreased engagement or usage of edtech due to COVID-19 and the protocols that followed in subsequent years. This was not a part of the selection criterion.

Researcher Positionality

As an exploratory case study, I conducted the study to better understand the gap between what parents and Gen Alpha students have on edtech in a learning environment. Research has been conducted to understand teacher positionality and expectations of edtech with the purpose of this case study to conduct new, age specific research than the previous Gen Z or Gen Y studies.

A pragmatism framework was utilized, as the practical implications of the qualitative study refer to what differences could be made to edtech enhanced classrooms with the knowledge gained of Gen Alpha expectations. Pragmatism is connected to purposeful inquiry as it has a "transformative, experimental notion of inquiry" (Casula et al., 2021, p. 1711). It is also important as a pragmatist to understand the body of research is never complete, but a continuing body of work that additional case studies can add valuable practical details. The study was guided by epistemological assumptions that by understanding the participants realities, in this case being expectations of edtech and their perceived grit, knowledge can be gained as to the experience of educational technology that applies to them. Thematically addressed conclusions are expected through the surveys and artifacts.

Interpretive Framework

The research paradigm of the case study was pragmatism as case studies are "central to pragmatism as a means to evaluate the consequences of personal and social choices" within the classroom environment (Mills et al., 2010, p. 725). The founders of pragmatism, Peirce, James, and Dewy shared a confidence "in the human capacity for learning, discovery, and invention"

that closely aligns with the intention of a case study: to understand how students learn or discover new literacy content (p. 724). As my intent was to understand how students feel about their grit and what they expect from edtech in a learning environment, I felt this closely aligned with the founders' confidence in understanding the capacity for learning. The pragmatism design used observation to understand the subjects, rather than test a hypothesis.

Philosophical Assumptions

It was understood that with all research there are certain assumptions brought by the researchers that may influence the data collection and analysis of the material. The goal of this section is to understand my assumptions so that readers can make decisions about the information that is being presented. There are three philosophical assumptions that will be addressed: ontological, epistemological, and axiological. Ontological assumptions address my belief in a single reality of truth. My epistemological assumption involves getting close to students as a part of the study to understand their experiences first-hand, rather than second-hand teacher interviews. As previous studies have shown (Weninger, 2018), teachers or parents may have different interpretations or perceptions of how students learn with edtech than their students. Finally, the axiological assumptions were addressed to understand the intent of my research as the aims of what I intended to learn through the process of the research.

Ontological Assumption

As an ontological assumption, I believe there is one reality based on God's truth. It is important to consider how this process is completed as a part of my research plan. One of the first considerations was in researching interpretations, attitudes, intentions, motives, or reactions. As a researcher, I attempted to represent my interpretations of student behaviors or motivations through purposeful observation checklists that will limit personal interpretations of the data sets.

Since educational technology enhanced literacy lessons can be delivered independently to students on their own devices, it was important to observe how they interact with the technology to understand or align with expectations learners described in student interviews. In this case study, the interview situation and the phenomenon may not be identical, as I was coming from the perspective of moderate constructionism that people bring basic perspectives, interpretations, or schemas with them to situations such as the viewing of an educational technology product (Höijer, 2008). Participants had some preconceived notion of technologies in classroom from their highly digital cohort as Generation Alpha learners and it may have contributed to the interview responses.

Epistemological Assumption

My epistemological assumption is that to accurately understand a qualitative study, I have to be as close as possible to the participants that are being studied without interfering with their actions. Epistemological assumptions rely on first-hand experiences of participants. For my assumption, it means to understand how students interact with edtech in a learning environment, I had to be able to observe them in pods or groups where I could see both the participant and the screen interactions. It means I did not rely on teacher observations as I believed these were removed from specificity and that teachers may have interpreted based on their comfort level or experience with technology. It was my goal to observe students without interfering in their learning. As a qualitative research study, much of the data collected was derived from the subjective experiences of a wide array of participants. Knowledge was gained as to the expectations they may have of edtech and their ability to sustain grit. Claims were justified through an 8-point grit scale developed by Duckworth (2022).

Axiological Assumption

It is important to address the axiological assumptions as a part of this case study. While I was no longer a classroom teacher, I did spend ten years working with students as an elementary teacher. I was an early adopter of technologies in the classroom and a significant participant in educational technology products during beta testing. After the classroom, I conducted teacher professional development in effectively integrating edtech before I became a product designer. As such, I view educational technology as an invaluable asset to the classroom for its ability to personalize learning for learners. The case study was conducted to the best of my ability without bias, reporting the facts what students expect out of edtech and how they rate their grit as a generational cohort. It was imperative to understand how students rated themselves as opposed to how teachers rate the quantitative facts of educational technology to see this.

Researcher's Role

As a researcher, I did not have any authority or connection with the participants in the study that would influence the data. The role as a researcher was to understand how Gen Alpha students rate their grit, what social norms may have influenced that grit, and to identify behaviors and characteristics of these learners while they interacted with edtech in learning environments. Together this helped to explore expectations Gen Alpha learners may have towards edtech in learning environments that can be combined with other studies of different age groups. Memoing took place during student interviews and student observations. This allowed for nonverbal responses that may better exemplify the experiences of the responses of participants.

Procedures

Prior to beginning the study, an application was submitted to the Institutional Review Board (IRB) for approval to conduct this study (Appendix A: IRB Approval Letter) and was followed by parental consents (Appendix J: Parental Consent) and child assent (Appendix I:

Child Assent to Participate in a Research Study). These letters clearly listed what the participants would be asked to do and how the collected data was intended to be used to facilitate the research. Site permissions were not needed.

The procedures for this study included a sample size of 12 students in grades third through ninth. They participated in two formats: in-person or remotely via zoom teleconferencing. Students that participated in-person belonged to the same regional location in a suburban neighborhood in southern Colorado. Those who participated remotely required a one-time set up call with the parent to discuss and test devices for the interview and observation of the child.

Participants were selected using a pre-established criterion that they are between third and ninth grade. Students' participation was voluntary. After participants were selected and appropriate consents had been retained, 12 participants were selected and completed an 8-point grit qualitative questionnaire (Appendix B: Duckworth 8-item Grit Scale and Score) that was scored (Duckworth et al., 2007). The maximum score on the 8-item grit scale was 5 and represented an extremely gritty person. Students then completed an interview about current perceptions of technology and technology in learning environments. This was followed by an observation during the students' usual homework time. Students were prescreened for a day when they will use an edtech tool. In the event the student was unable to complete the assignment using the edtech tool, a separate non-tech tool was used to measure the students' relative behaviors. The total time did not exceed one hour for students.

Student interviews were conducted first to understand any social norms that may affect how Gen Alpha learners rate their grit and to better understand expectations they may have of edtech products in learning environments. It consisted of 16 open-ended questions. Responses

were thematically grouped in a chart with representative participant quotes. Audio and transcriptions were used and available only to the researcher. Observations were conducted to identify behaviors or characteristics while using edtech. Observation documents included screenshots of time spent in product, modules or lessons completed, or photographic interactions of the student with the edtech.

Figure 2

Edtech Observation Checklist

Device type	Laptop	Desktop	iPad/tablet	Other:
Use type	Web based	App based	Software	Other:
Subject	Math	ELA	Other:	

Navigation Observations	**Often**	**Somewhat**	**Not at all**	**N/A**	**Notes:**
Read/used instructional pages or directions					
Followed linear progression through learning objective					
Rapid clicked through edtech components					
Engaged in-product supports (help menu, information icons) for navigation					
Engaged supports for product navigation (asks researcher for help navigating)					

Usage modality: Mouse, touchscreen, one hand, two hand navigation,					
Academic/Instructional Observations	**Often**	**Somewhat**	**Not at all**	**N/A**	**Notes:**
Attentive to task/assignment					
Completed task					
Engaged in-product learning supports: *Circle as needed:* (vocabulary assistance, translation, text to speech, tutorials, examples, video explanations, graphics, narration/read aloud supports Other: _____					
Social Observations with Edtech	**Often**	**Somewhat**	**Not at all**	**N/A**	**Notes:**
On task					
Organized workspace					
Interacted appropriately with edtech					
Maintained eye contact with edtech					

Remained in allotted space *Circle as needed:* Standing Seated Constantly moving body Relatively stationary Knocked over seat Other: _____					
Showed enthusiasm/high interest					
Worked willingly and without frustration					

Figure 3

Non-Edtech Observation Checklist

Device type	Worksheet	Book	Other:	
Use type	Textbook related	Supplemental: teacher created	Supplemental: unknown	Other:
Subject	Math	ELA	Other:	

Navigation Observations	**Often**	**Somewhat**	**Not at all**	**N/A**	**Notes:**
Read/used instructional pages or directions					
Followed linear progression through learning objective					
Rapid progression through assignment components					
Engaged supports for assignment navigation (asks researcher for help navigating)					

Usage modality: Journal, digital, worksheet, or other (circle as needed) If other: _____					
Academic/Instructional Observations	**Often**	**Somewhat**	**Not at all**	**N/A**	**Notes:**
Attentive to task/assignment					
Completed task					
Engaged learning supports: *Circle as needed:* (vocabulary assistance, translation, text to speech, tutorials, examples, video explanations, graphics, narration/read aloud supports) Other: _ _____					
Social Observations with Edtech	**Often**	**Somewhat**	**Not at all**	**N/A**	**Notes:**
On task					
Organized workspace					
Interacted appropriately with assignment					
Maintained eye contact with assignment					
Remained in allotted space *Circle as needed:* Standing Seated Constantly moving body Relatively stationary Knocked over seat Other: _____					
Showed enthusiasm/high interest					
Worked willingly and without frustration					

Research Design Overview

Memoing and open coding were used and grouped according to common behaviors and characteristics across all participants. An observation checklist describing and categorizing the

edtech tool within its learning environment was used (Appendix G: Observation Checklist). Student interviews, questionnaires, and student observations triangulated through comparative analysis to form a single body of research for each student's grit and expectations of edtech.

Permissions

Full compliance were obtained from the Liberty University IRB (Appendix A: IRB Approval Letter). A child assent (Appendix I: Child Assent to Participate in a Research Study) and parental consent (Appendix J: Parental Consent) was obtained. Since the study took place in the home where students reside with their parents, site permissions was not required.

Recruitment Plan

To solicit participants, the recruitment plan outlined incentives and communication structures for a total sample of 12-15 students in grades 3-9. Pre-established criteria included students who were enrolled in classes from third through ninth grade in a suburban northern Colorado neighborhood or participate remotely via teleconferencing plan. Parents were incentivized by better understanding their child and how they learn with edtech with a customized summary of the results. A recruitment flyer was used for in-person participants in a neighborhood Facebook group and the neighborhood WhatsApp message (Appendix K for Recruitment Flyer). Students participating remotely were recruited through a Facebook post of the same flyer. The pre-screening ensured the responses from parents represent students between the third and ninth grade and have availability to participate using teleconferencing with an additional setup session prior to the study. As there were many edtech companies in the Colorado area, it was important to include those from outside the region to ensure the students participating are not all from families that use more technology or have higher technology aptitudes than other similarly aged students.

Data Collection Plan

The data collection design strategy employed for this case study aligned with the central research question and three sub-questions. An 8-item qualitative questionnaire was used to understand what drives the development of grit in 3rd-5th grade Gen Alpha learners (Appendix B for Duckworth's 8-item Grit Scale and Score). Student interviews were used to understand social norms that may affect how Gen Alpha learners rate their grit (Appendix E for Individual Interview Questions). Individual interviews, conducted with students, were similarly conducted to allow for real life behavior of participants to enrich the researcher's understanding (Kross & Giust, 2019). Observations of students using edtech for their homework was used to identify the behaviors or characteristics of Gen Alpha learners while using edtech. According to Kross and Giust (2019) observations and participant descriptions work together to build this understanding by providing a fuller, more quality data set.

Questionnaire Data Collection

I used the 8-item grit scale as a qualitative questionnaire at the start of the data collection for each of the student participants. The grit scales had been made available to researchers and educators by Angela Duckworth (2022) on her website for non-commercial purposes. The permission to use can be viewed in Appendix C. Duckworth recommended using the 8-item grit scale for younger participants instead of the 12-item grit scale. I used the recommended grading formula:

Scoring:

- For questions 2, 4, 7, and 8 assign the following points:
    - 5 = Very much like me
    - 4= Mostly like me

    - 3= Somewhat like me
    - 2= Not much like me
    - 1= Not like me at all
- For questions 1, 3, 5, and 6 assign the following points:
    - 1= Very much like me
    - 2= Mostly like me
    - 3= Somewhat like me
    - 4= Not much like me
    - 5= Not like me at all
- Add up all the points and divide by 8. The maximum score on this scale is 5 (extremely gritty), and the lowest score on this scale is 1 (not at all gritty).

Survey/Questionnaire Questions

- New ideas and projects sometimes distract me from previous ones. *
    - Very much like me
    - Mostly like me
    - Somewhat like me
    - Not much like me
    - Not like me at all
- Setbacks don't discourage me.
    - Very much like me
    - Mostly like me
    - Somewhat like me
    - Not much like me

    - Not like me at all
- I have been obsessed with a certain idea or project for a short time but later lost interest. *
    - Very much like me
    - Mostly like me
    - Somewhat like me
    - Not much like me
    - Not like me at all
- I am a hard worker.
    - Very much like me
    - Mostly like me
    - Somewhat like me
    - Not much like me
    - Not like me at all
- I often set a goal but later choose to pursue a different one. *
    - Very much like me
    - Mostly like me
    - Somewhat like me
    - Not much like me
    - Not like me at all
- I have difficulty maintaining my focus on projects that take more than a few months to complete. *
    - Very much like me

    - Mostly like me
    - Somewhat like me
    - Not much like me
    - Not like me at all
- I finish whatever I begin.
    - Very much like me
    - Mostly like me
    - Somewhat like me
    - Not much like me
    - Not like me at all
- I am diligent.
    - Very much like me
    - Mostly like me
    - Somewhat like me
    - Not much like me
    - Not like me at all

Survey/Questionnaire Data Analysis Plan

According to Duckworth et al. (2007), grit is sustained interest and sustained effort toward long-term goals. Her scales were designed to assess individual grit. The provided scoring of grit includes giving a score to each question, adding them together, and then dividing by the number of items. The maximum score on her 8-item scale was 5 and was considered an extremely gritty person. The lowest score on her scale was 1 and was considered not at all gritty.

Individual Interviews Data Collection

Individual student interviews were conducted to understand what expectations students have of edtech or technology within learning environments. These were conducted with a semi-structured approach, beginning with a grand tour question to precede other interview questions to learn expectations they may have of edtech. Interviews were conducted in the students' homes during times designated by the parents. I used interview questions following a grand tour question, where students describe how they feel about edtech tools during instructional time. The purpose of the grand tour question was to allow for students to feel more comfortable expressing their opinions of edtech tools with a researcher (Marshall & Rossman, 2015).

Individual Interview Questions

1. Guided tour question: What are some ways you use technology? RQ1, SQ2
2. (Using three of the mentioned examples) What do you expect when you use [one of the student's responses from the previous question]? RQ1, SQ2
3. [Follow up]: of the ones you mentioned, which one is the most important? Why? RQ1, SQ2
4. Next, let's talk about some ways you use technology, specifically for learning. What's a technology you use for learning? SQ3
5. (Using three of the mentioned examples) What do you expect when you use [student motioned item from previous question]? SQ3
6. [Follow up]: Of the ones you listed, what would you consider the most important? Why? SQ3
7. Name a technology you use for learning that your teacher picked. Why do you think your teacher picked it? RQ1

8. I'm going to show you a list of words. You can circle as many or as few as you'd like. The words you circle should represent things you think this technology does for you. If you're not sure how to read a word or what it means, I can help. SQ3
    a. Word choices: create, watch, research, collaborate, listen, read, write, adapt, practice, solve
9. Follow up: Let's compare this to words you'd circle to represent technology that you picked from the first question. These are things you use in your home and are not specific to school or learning.
10. Next, I'll say a sentence about technology. You get to tell me how much it sounds like something you would say. We'll use the same choices you had on the survey you did before our interview: Very much like me, mostly like me, somewhat like me, not much like me, or not like me at all. [Students will see a visual of these choices]. You can point to which answer sounds most like you or you can say it aloud.
    a. Technology can solve problems for me.
    b. Technology can solve problems in the world today.
    c. Technology will solve problems in the world in the future.
11. I'm going to make three statements about how you might use technology when you're learning. If you can only pick one, which statement sounds most like you? [Show the students a visual of the statements as they are read] SQ2, SQ3
    a. I like to use technology when I'm learning because it helps me learn how to do new things
    b. I like technology when I'm learning because it does things for me
    c. I like technology when I'm learning because it keeps me interested

12. Tell me about a goal that you're working toward. How are you doing on that goal? SQ1, SQ2
13. How do you decide if or when you should stop working towards a goal? SQ1, SQ2
14. What are some things that might make you feel like you'll have higher grit? SQ1, SQ2
15. What are some things that might make you feel like you'll have lower grit? SQ1, SQ2
16. What else would you like to add about using technology to learn that you wished people knew?

    RQ1

The questions will help to understand what expectations students may have of technology in general and then more specifically about edtech or technology in a learning environment. Questions will transition from their daily lives outside of class to in class, to more specific purposes while learning to capture expectations at each stage. There are also questions to understand student grit. Together these questions will guide an understanding of what expectations they have of edtech and what they believe about the purpose of technology for them. These have been common differences between students and educators in previous research.

Individual Interview Data Analysis Plan

A thematic content analysis of the interview transcripts was conducted to weed out biases and establish an impression of the data from a holistic view. The thematic analysis was used as a process for encoding qualitative information that also allows for the translation of qualitative information (Boyatzis, 1998). This included four stages. The first was recognizing the codable moments within the interviews. The second was to do it reliably: recognize and repeat it with consistency across all participants. The third stage was to develop codes. The final state was to

interpret the information and themes "in context of a theory or conceptual framework" (Boyatzis, 1998, p. 11).

Observation Data Collection Approach

Observations were conducted to observe student's interactions with edtech tools using a checklist (Appendix F for Observation Checklist). The checklist was comprised of three sections: navigation, academic, and social behaviors. Each observed behavior was ranked according to frequency using often, somewhat, not at all, or not applicable if the edtech product does not have the capacity for that student behavior. Memoing was captured in the notes section for each behavior to identify any other pertinent details of the learners' interactions with the edtech tool. General information about the edtech was also included in the checklist. It included device type and subject area. The purpose of observations was to correlate student interview responses with student observations. Together these were compared with documents to triangulate student expectations of edtech and how they rate their grit. I was not a participant during the observations. At least three observations were conducted per participant of at least 20 minutes. During the observations, I took notes of student behaviors, interactions with the edtech tool, and other student actions without interfering with the student directly.

Figure 2

Observation Checklist

Device type	Laptop	Desktop	iPad/tablet	Other:
Use type	Web based	App based	Software	Other:
Subject	Math	ELA	Other:	

Navigation Observations	**Often**	**Somewhat**	**Not at all**	**N/A**	**Notes:**

Read/used instructional pages or directions					
Followed linear progression through learning objective					
Rapid clicked through edtech components					
Engaged in-product supports (help menu, information icons) for navigation					
Engaged supports for product navigation (asks researcher for help navigating)					
Usage modality: Mouse, touchscreen, one hand, two hand navigation,					
Academic/Instructional Observations	**Often**	**Somewhat**	**Not at all**	**N/A**	**Notes:**
Attentive to task/assignment					
Completed task					
Engaged in-product learning supports: *Circle as needed:* (vocabulary assistance, translation, text to speech, tutorials, examples,					

video explanations, graphics, narration/read aloud supports Other: _____					
Social Observations with Edtech	**Often**	**Somewhat**	**Not at all**	**N/A**	**Notes:**
On task					
Organized workspace					
Interacted appropriately with edtech					
Maintained eye contact with edtech					
Remained in allotted space *Circle as needed:* Standing Seated Constantly moving body Relatively stationary Knocked over seat Other: _____					
Showed enthusiasm/high interest					
Worked willingly and without frustration					

Figure 3

Non-Edtech Observation Checklist

Device type	Worksheet	Book	Other:	
Use type	Textbook related	Supplemental: teacher created	Supplemental: unknown	Other:
Subject	Math	ELA	Other:	

Navigation Observations	**Often**	**Somewhat**	**Not at all**	**N/A**	**Notes:**
Read/used instructional pages or directions					
Followed linear progression through learning objective					
Rapid progression through assignment components					
Engaged supports for assignment navigation (asks researcher for help navigating)					
Usage modality: Journal, digital, worksheet, or other (circle as needed) If other: _____					
Academic/Instructional Observations	**Often**	**Somewhat**	**Not at all**	**N/A**	**Notes:**
Attentive to task/assignment					
Completed task					

Engaged learning supports: *Circle as needed:* (vocabulary assistance, translation, text to speech, tutorials, examples, video explanations, graphics, narration/read aloud supports) Other: _ _____					
Social Observations with Edtech	**Often**	**Somewhat**	**Not at all**	**N/A**	**Notes:**
On task					
Organized workspace					
Interacted appropriately with assignment					
Maintained eye contact with assignment					
Remained in allotted space *Circle as needed:* Standing Seated Constantly moving body Relatively stationary Knocked over seat					

Other: _____					
Showed enthusiasm/high interest					
Worked willingly and without frustration					

Observations Data Analysis Plan

The three sections of the checklist served as the primary data retrieval for observations. Memoing and open coding were used to record observations of students interacting with the edtech resource as needed. The results were coded and organized into themes. The observation data was kept according to student as a comparison to the student interviews and documents. It allowed for a focused approach of student behaviors that is consistent across all participants. Common behaviors and characteristics were observed and may reflect experiential learning with an edtech tool. This included immersive edtech experiences, either independently or collaboratively, and added to the body of research on Gen Alpha behaviors while using edtech.

Data Synthesis

Student interviews, the 8-item grit scale, the observation checklist, and student documents represent the student data collection. The data from these was synthesized around themes to understand what expectations Gen Alpha students have of edtech and how they rate their grit. It was used in a comparative analysis against the triangulated student interviews, observation checklist, and documents to understand how students had used edtech in the past,

how they felt about edtech tools as a learning tool, and what expectations may have been made by students when considering edtech tools. The goal was for the body of research to enable more effective edtech products to be designed for student learning and to provide research that could close the gap between educators and their learners on edtech. Overall, the purpose of this exploratory case study was to understand the expectations Generation Alpha (Gen Alpha), those born between 2010 and 2024, has on educational technology (edtech) in learning environments and how those students rate their grit with 12 participants in third through ninth grade.

Trustworthiness

This section describes the measures that were taken to assure a rigorous study through the lens of Cutler et al. (2021). This included a careful examination of credibility, transferability, dependability, confirmability, and ethical considerations. Every effort was made to represent the facts of the study in a logical, orderly fashion with sufficient synthesis that informs trustworthy conclusions. As a researcher, it was important that this work could be used to further the field. Credibility and transferability were significant dependencies of this goal.

Credibility

Credibility can be defined as an approximation of the truth of the phenomenon in question (Cutler et al., 2021). I achieved credibility in three ways: (1) triangulation of the student data, (2) peer debriefing, and (3) member-checking of the transcribed student interviews and the focus group interviews. This was done through a parent or guardian confirmation at the students' home apart from the researcher. The goal of this as to ensure what took place during observations is accurately reflected in the notes. Member checking was done with the parent and student as appropriate.

Transferability

According to Cutler et al. (2021), transferability is the ability for the findings of a study to be applied to other contexts. This was done through extensive descriptions of the research findings. The alignment across the various home locations was similar. The edtech tool was grade banded (3-9) or age bracketed (7-14 years old) and was not grade specific, as typical in these types of tools. Strategies and supports were available equally to all grades and locations as a part of the edtech tool.

Dependability

According to Cutler et al. (2021), dependability shows that the findings are consistent and could be repeated. This includes making sure the procedures were clearly outlined and straightforward so that it could be repeated at various grade levels or at a contrasting population type. Peer review of the procedures and a review by the committee ensured the I had sufficient explanation. The goal as that the same study could be conducted again with similar results. Without clear explanations, this would not be possible. It is my belief that previous studies have had mixed results in the field due to unclear explanations or a check on implementations given to students.

Confirmability

Confirmability can be defined as the degree of neutrality or the extent to which findings of a study are shaped by the respondents and not researcher bias, motivation, or interest (Cutler et al., 2021). Triangulation of the body of student data helped remove researcher bias and enhanced confirmability. The audit trail was also represented by a documented path from procedure to raw data and analyzed data for the final report that can be reviewed. Memoing

during interviews and observations helped to record nonverbal data that can contribute to confirmability.

Ethical Considerations

As students were under the age of 13, parental consent was required. Other ethical considerations included informing participants of the voluntary nature of their participation in the study and the right to withdraw from the study at any time. Confidentiality, including the use of pseudonyms, and a discussion of how data was secured was included in the participation information as a part of the recruitment process. Data was secured directly on my computer and not uploaded to any shared data cloud sites. It will be deleted after three years. While a summary of the study was made readily available, it did not include identifiable information of the student to protect their rights and anonymity. School specific information was also not reported.

Summary

An exploratory case study approach was used understand what expectations Gen Alpha has on edtech in their learning environments, and how they rated their grit according to an 8-item grit scale and interview questions. The study provided content to identify details of development, distinctive features, or commonalities across all cases (Mills et al., 2010). It was guided by epistemological assumptions. The research paradigm was pragmatism as it best suites the case study design with a contemporary setting within the learning environment. Permissions were obtained for parent and student participation. Recruitment was voluntary, with a purposeful sampling students within grades three and nine with a goal of 12-15 participants. There was an 8-point qualitative questionnaire, a student interview, and a student observation. All efforts were made for ethical considerations with a careful examination of credibility, transferability, dependability, confirmability. As the goal was that this case study would be seen as a part of the

research for furthering the field, it was important that I met or exceeded expectations in the research process.

CHAPTER FOUR: FINDINGS

Overview

The purpose of this exploratory case study was to understand the expectations Generation Alpha (Gen Alpha), those born between 2010 and 2024, has on educational technology (edtech) in learning environments and how those students rate their grit with 12 participants in third through ninth grade. Students were chosen between third and 8th grade to participate through a questionnaire, an interview, and an observation. Two themes emerged. The first theme, technology as a tool to help, contained three subthemes that describe what participants viewed the technology able to help with and what they perceived their educator thought it should help with. The second theme, technology as a way to communicate, contained two subthemes. These subthemes included technology to communicate with friends and to make new friends or playing with friends. Outliers will be discussed as they pertain to the student interviews where a single participant or answer varied far from the typical. Finally, the central research question and three sub-questions will be addressed against the data.

Participants

Participant pseudonyms are used in the following table for both participant names and school names for the protection of the anonymity of the participants and locations. Twenty five percent of the participants were female. Seventy five percent were male. There were 67% elementary participants and 33% middle school. All but one participant, Alex, attended school in person. Two participants, Seth and Juan, participated in the study remotely. There were five schools represented across three districts.

Jeremiah

Jeremiah is an eleven-year-old, male, who enjoys outdoor hobbies like dirt-biking and hiking when the weather is amiable. He values technology when it has a specific use. Because of this, he prefers to use technology for functionality as a tool rather than for entertainment. He wishes teachers would focus more on teaching him and his classmates how to use technology rather than assuming everyone is born an automatic master of Chromebooks. He knows his younger brother is more comfortable with edtech and wishes for some of the same intuitiveness. He considers himself fairly gritty, with a score of 3.5 out of 5 on his questionnaire. Jeremiah is a seventh grader at a middle school in Northern Colorado.

Anthony

Anthony is a twelve-year-old male seventh grader at Belle Middle School, a Northern Colorado school. He scored a 2.8 out of 5 for grittiness and is largely driven by what he can share with friends. He views technology largely within the scope of communication. He enjoys using it to communicate with his friends and feels it is the most important feature when considering new technology. He sees the potential in his school's adoption of the Google suite to use edtech to communicate for projects and to collaborate but is overly disappointed in his teacher's lack of know-how or interest in these opportunities. He does not see it changing either. "Some school computers can't get to the right programs or websites. Teachers are alright with that. They don't like tech." Most of his school use of technology is independent work in Clever with some assignments in google slides, google docs, or google forms, but none of the collaboration tools are used, even by teachers. Anthony believes technology solves problems for him, the world, and will continue to solve problems in the world in the future. He is enthusiastic about where technology is going, but not edtech. If there was one thing he wishes people knew

about technology, it is that his teachers knew “it’s not all bad” and that the actions of a few students do not reflect everyone’s choices. “I think it’d change people attitudes about technology in school” if they knew you could actually program computers to do only school designated things with the right protective structures.

Joseph

Joseph is a ten-year-old male sixth grader who attends Amry Elementary school, a Northern Colorado school. He is a technology enthusiast who finds technology useful, something that solves the problems of the world today and will even more so in the future, and enjoys learning new navigation shortcuts that go beyond simple understanding. He primarily uses I-Ready with his school issued Chromebook, an individualized learning and assessment solution. While Joseph is aware of the lessons available that his school pays for in I-Ready, his teacher only lets the class use it for the assessments. While he enjoys technology, he does want it to come with boundaries, specifically blue light glasses, and time limits because otherwise “people don’t want to get their hands dirty.” He does not want an overreliance on technology and that there is “real life” and “drill bits” out there to experience. His grit score is 3.5 out of 5 overall and believes no goal is worth giving up until it is achieved.

April

April is an eight-year-old female third grader at Amry Elementary, a Northern Colorado school. She is an avid gamer, uses technology in nearly all aspects of her life, but goes to a school that “doesn’t really use or even like technology.” She feels the technology that her teacher most values in the learning environment is her “laser pointer because it makes it easier for her.” When describing her expectations for technology outside of the learning environment, she has high expectations in terms of video requirements, current music, communication needs, and

games. Her expectations for school technology is simpler, “just that the internet won’t fail and they turn on or are charged.” She does not appreciate capital punishment or technology restrictions as punishments. A student had played with the mouse hardware during a test at the beginning of the year, “and now no one can use the mice ever again” even though “the mouse is way easier than the trackpad.” According to April, she “doesn’t really learn” with her school issued computer, and instead only uses it for “diagnostic and growth checks with I-Ready.” April did share her teacher also uses Kahoot, but was careful to specifically categorize it as an assessment tool and not a learning tool. “It’s a race. Solve a math question. Solve the next one,” and that “maybe it’s a little more fun than a worksheet, but it’s basically still just a worksheet.” Given three statements about technology and its ability to solve problems for her, the world, or in the future, she most identifies that technology solves problems for her today. Unfortunately, she does not see school as a trustworthy source to teach her about technology or how it could solve problems. If it were her choice, she would like to use technology when she is learning to help her learn to do new things. She values this more than having technology do things for her or using it to keep her interested in a specific topic.

Alex

Alex is a nine-year-old male in the fourth grade at Caster Elementary and attends school remotely at a statewide online district in Colorado. He is more technologically savvy than most, with exciting thoughts for how edtech and technology could and should be made even better. He hopes “it doesn’t take forever” because he wants to be among the first to benefit from better solutions. He says “creators should talk to the kids, not the teachers when making learning stuff for kids. We know more. Some teachers are still learning about the internet.” He values personalization but thinks machine learning should take care of most settings. “You have to enter

your birthday for everything, and they don't even do anything with it. Why couldn't they celebrate my birthday with an avatar party or extra game time?" Alex also thinks non-game makers should stop trying to make games when their specialty is learning. Instead, integrations should be used because "no one makes games as good as them" and students would feel more excited to learn if brain breaks were "recognizable games instead of knockoffs that aren't as good." He also thinks there are missed opportunities on snow days, long weekends, and holiday breaks that could have "special game achievements for kids that log into their school programs." He points out that game achievements are as simple as a special skin for your character or an award "but not the awards that are in IXL. They gave me a picture of a tricycle today for completing work with decimals. What am I supposed to do with that?" He says some edtech uses traditional backgrounds that he finds frustrating. This includes wooden desks in rows instead of flexible seating, and teachers using chalkboards, though Alex did not know the actual word for this type of board. He thinks these images create negative connotations towards edtech instead of exciting students. Overall, he believes technology definitely helps him solve problems today and will continue to solve more problems in the world in the future. He corrected one of the question prompts, feeling that it was not clear enough that "technology isn't going to do anything for me. It's going to help me do things." When discussing grit, he does not believe in giving up because "you should never give up on your dreams. Even if no one is pushing me, I will still not give up."

Juan

Juan participated in the study remotely from a school in Northern Colorado, Edward Elementary, and is an eight-year-old male and third grader at this school. He finds a lot of motivation in technology. Good behavior equals more screen time, something he feels helps him

make better choices in school "even when I have a bad attitude." He feels his parents are lenient with screen time largely because his dad loves gaming too. He wants to use more technology in school and hopes when he gets into upper grades that those "teachers will know more about technology." Most of his expectations for technology outside of the classroom revolve around communication and gaming so he can stay in touch with both friends and family that do not live close. Common to other students, he also finds frustration in the IOS and Android 'war.' "It just makes it more difficult than it needs to be," he says in terms of communication. He points out that its especially unfair for kids since they are not the ones buying the phones but are stuck with the repercussions. He most identifies that technology can solve problems for the world in the future and that he would like technology when learning because it helps him learn to do new things.

Lana

Lana is an eleven-year-old female and sixth grader at Belle Middle school, a Northern Colorado school. She prefers to use technology for communicating with friends and gaming. Her expectations for her personal use of technology includes top photography, video, and streaming capabilities and "it should be easy to use." Much of her free time is spent exploring photography with various apps that make editing intuitive and inventive. She does not stay with the same apps over time and instead elects to use newer and more inventive apps with the most current filters, features, or settings. When considering her learning environment, she has a school issued Chrome book that she feels is not being utilized to its capacity. "We don't use anything fun. It's just about taking tests online because I think it's easier for the teachers to grade." There is no opportunity to use technology for school issued photography classes. "They have photography, but they don't teach anything that I'd actually use," she says. Specifically, teachers do not

include any editing apps and instead focus on “how to use a camera. The best lens to buy. Things like that.” Though she did enjoy learning how to develop her own film, she does not think this is a skill that translates to real life.

Barry

Barry is a ten-year-old male at Amry Elementary in the fifth grade at a Northern Colorado school. He enjoys exploring new tech features and shortcuts on his school issued Chrome book. He knows classmates that have explored further, dabbling in hacking, and seems intrigued by the opportunities as a field. He wishes his teachers knew “some kids are really smart and hacking their computers.” I-Ready math lessons, brain games, and assessments are his main edtech interactions. When asked what he expects from technology in the classroom he said, “I don’t really expect anything. I’ve done the same things a lot.” He does not feel his teacher makes good use of free time on the computers. Students choose Coolmath games “which doesn’t have anything to do with math or learning.” He also believes the school edtech choices are more fluid than they are prepared to handle. “The district picked I-Ready. My teacher picked Swora last year. This year it’s Epic, it’s a reading thing, but doesn’t have any books I like.” There was a nuance to how Barry differentiated between district choices and teacher choices indicating there may be a gap between which ones are actually being effectively adopted by classrooms. During observations, he often was off-task of the learning objective and instead spent time seeing what happened if he chose the wrong answer on purpose, what supports were available, and if there were shortcuts to using the trackpad. When using technology on his own, Barry looks for something “for my friends to be on, definitely online play features” and connectivity. He also uses a lot of games offline during roadtrips and believes good technology should fit both online and offline needs. He prefers games without an end and that feature collaborations with a team to

battle opposing teams. The best games are those "where you're in a small area, you can do player versus player, but still have to work together."

Lucas

Lucas is a nine-year-old male at Amry Elementary in the fourth grade. He spends most of his time outside or traveling with his family and expects his technology to fit his lifestyle. To Lucas, this means trail apps for his watch when he bikes, GPS capabilities, health stats, and other features to enhance his hobbies outside. He also uses an iPad while traveling and wants it to have high quality gaming and video features. For Lucas, high quality gaming includes the ability to "make something. I want to build things that I can play with my friends." Collaboration and connectivity is a key component for any technology he uses. When it comes to technology in his learning environment, he feels it is mostly to "turn in assignments or take tests." He does not feel he uses it for learning. His motivation for edtech varies depending on the purpose. He said "if it's for a grade, I'd work hard. I wouldn't work as hard for an end of the year test or anything." His grit score for his 8-item questionnaire is 2.8 out of 5.

Seth

Seth, a ten-year-old male and fourth grader at Ducks Elementary, participated in the study remotely. His school is in a central Texas school district. He loves gaming, specifically ones that involve world building and creative opportunities and that allow him to stay in touch with his friends. He has friends that have moved away and some that he has only ever known long distance that he keeps in communication with via gaming and conferencing apps. For him, technology does things that would otherwise be impossible: "There's no way I would be such close friends with Alex without technology." High on his priority of technology qualifications are the integrations between conferencing. It frustrates him that some friends have IOS, and

some are Android and that the two operating systems are “hostile” towards each other. It becomes an additional challenge for him, meaning he has to call friends on multiple devices to use both WhatsApp and FaceTime while trying to game together on Minecraft. His parents have strict limits on screen time, which he understands, even though he would choose to “be online all the time” because “it’s where my real friends are.” His school changes technology services and software “all the time” with this year’s math being DreamBox. If there was something he wishes everyone knew about technology, it would be that “it can help us” and that it makes him more creative.

Pete

Pete is an eight-year-old male at Amry Elementary in the third grade. Technology is a big part of Pete’s daily life with two gaming consoles and multiple personal devices. He wants to see integrations, communication features, and high-speed streaming that can keep up with his high speed internet. According to Pete, “nothing is worse when you’re gaming than when you start to lag.” His games choices include Roblox and Minecraft, where “I create worlds for me and my friends. Sometimes I play with other people I’ve never met too.” He seems to enjoy the creativity and constant change of options found in both. He also plays games featuring music, dancing, and battling for a wide range of gaming experiences. In school he does not have high expectations for technology use. “My teachers don’t really like technology.” Similar to other students, he wants edtech to work, but has few other expectations. When asked to identify edtech in his own classroom use, he named Chromebooks that he uses during testing windows on I-Ready. During observations, he read a book for homework and was largely unable to focus on the task. His grit score was 3.6 out of 5.

Anabelle

Anabelle is a twelve-year-old female at Belle Middle School in the eighth grade. She uses technology as a safety or security tool when she babysits. She feels it is important to use technology "to be able to communicate even if nothing is necessarily right or wrong. It's just good to have it if you need it." She is the only participant that did not list a gaming console as something she interacts with though she did list it as something members of her family use. She enjoys reading eBooks, using her iPad for recipes or "looking up things to cook with my mom." In terms of edtech, she uses "Google to turn things in. Sometimes my teachers will leave comments on my papers, but not very often. Mostly we get a rubric back with comments." The rubric is a separate, paper copy she receives from her teachers. Like other students she mentions assessments or progress checks as the main use for her Chrome book in the learning environment. She does not have any goals she is pursuing, but she does consider herself a fairly gritty person with a 3.9 out of 5 score on her questionnaire.

Table 2

Student Participants

Student	Age	Sex	Grade	School District	In-Person/Remote	Grit Rating
Joseph	10	Male	6th	Belle Middle School	In-Person	3.6
Anthony	12	Male	7th	Belle Middle School	In-Person	2.8
Jeremiah	11	Male	7th	Belle Middle School	In-Person	3.5
April	8	Female	3rd	Amry Elementary	In-Person	3.9
Alex	9	Male	4th	Caster Elementary	In-Person	3.9
Pete	8	Male	3rd	Amry Elementary	In-Person	3.6
Lana	11	Female	6th	Belle Middle School	In-Person	3.5

Barry	10	Male	5th	Amry Elementary	In-Person	3.6
Lucas	9	Male	4th	Amry Elementary	In-Person	2.8
Seth	10	Male	4th	Ducks Elementary	Remote	3.9
Juan	8	Male	3rd	Edward Elementary	Remote	2.8
Anabelle	12	Female	8th	Belle Middle School	In-Person	3.9

Results

There are two themes that emerged from the data collection. These relate directly to the research questions. The first research question asks how the development of 3rd through 9th grade Gen Alpha learners grit was driven. This directly relates to two themes: Technology as a tool to help and technology as a means for communication (Table 3). The second research question asks how Gen Alpha learners interact with edtech. This directly relates to how technology and edtech is viewed as a means to communicate (Table 3). Several words emerge in the coding of the student interviews that also support these interactions (Table 6). Together, these represent the body of results as seen through the data collection with student interviews, the questionnaire, and the student observations.

Table 3

Results

Research Questions	Themes & Subthemes	Evidence
How is the development of 3rd-9th grade Gen Alpha learners grit driven?	Technology as a tool to help: a) Technology as an innovative tool to facilitate higher-order actions that	"Technology isn't going to do anything for me. It's going to help me do things." (Alex)

	are impossible without the use of technology b) Edtech as an entry level tool to deliver curriculum content c) Edtech as a tool to track progress	"It's just about taking tests online because I think it's easier for the teachers to grade," (Lana) "IXL gave me a picture of a tricycle today for completing work with decimals. What am I supposed to do with that?" (Alex)
How do Gen Alpha learners interact with tech & edtech?:	Technology as a means for communication a) Technology to communicate with friends b) Technology to play with or make new friends	"There's no way I would be such close friends with Alex without technology," (Seth)

Theme 1: Technology as a Tool to Help

Student participants believe technology is a tool that can help them. This was seen during the student interviews when students were given a list of action words. They were asked which words they thought applied with their personal technology choices, such as Xbox, television, iPads, gaming consoles, or other items they listed in a previous question from the interview. Using the same list of words, they were also asked which words applied to an edtech example they had mentioned. On average, students chose six words out of eleven as action words that

resonated with their personal technology choices. The words they selected for personal technology were much different from the words they associated with edtech. The full list can be viewed in Table 4 below. Most commonly, students associated create, watch, collaborate, listen, and remember with their personal technology. The selection of these words helps support the two sub themes: technology as an innovative tool to facilitate higher-order actions and edtech as a passive tool to deliver curriculum content. Students also see technology within the classroom as a very specific kind of tool to help them, namely, to track learning progression, turn in assignments, or track progress through assessments. Notably absent from how students perceived edtech was for its ability to help them learn.

Table 4

Action Words

Action words	Selected for personal technology	Selected for educational technology
Create	92%	8%
Watch	100%	83%
Research	25%	50%
Collaborate	83%	0%
Listen	67%	8%
Read	50%	100%
Write	25%	100%
Adapt	8%	16%
Practice	50%	92%
Solve	50%	67%

Sub-Theme 1: Technology as an Innovative Tool to Facilitate Higher-Order Actions

Choices and expectations of technology outside the classroom environment are about innovation and higher-order actions. This can be seen in the action words students selected when given a list of words that they felt applied to their personal technology choices. When asked which action words they associated with technology, 92% of participants selected to *create* for their personal technology, while only 1 student (8%) said they used classroom technology to create. This was similarly observed; students did not create anything with their homework. They read a book, digitally or in print, completed an assessment, or checked their grades. Through memoing and coding of the interviews, many students repeated the same words when describing their expectations of personal technology. April said, "it should definitely have a good camera or video capability," words that are mentioned by 8 out of 12 participants. All of the students that mention using their personal technology to game, also mention expecting good integrations between systems. This was mentioned in the context of communication, that is video conferencing features between iOS and Android, and in the context of shared gaming environments. Juan, Alex, April, and Seth all referenced gaming as a part of how they interact with technology and all mentioned integrations between their gaming environments in various combinations: Xbox servers allowing PlayStation users to join, PlayStation allowing iOS users to join, or iOS allowing either Xbox or PlayStation users to join. Alex expected artificial intelligence (AI), sometimes referred to as machine learning (ML). According to Alex, he expects AI to "recommend things similar to what I've already done. YouTube, YouTube Music, Roblox…they all use AI to predict what I might click on."

Participants have high expectations of their technology. It should be immersive, have high quality tools and functions, and be personalized through either AI, ML, or manual selections. They also use technology to do things that would otherwise be impossible. Seth said, "there's no way I would be such close friends with Alex without technology." These represent their belief of technology as an innovative tool to facilitate higher order actions. Students frequently referenced interactive elements such as "build," "make," "create," and "practice" (Table 6). These are supported with their action word choices of *create* and *practice*. These same expectations do not exist for edtech.

Sub-Theme 2: Edtech as a Passive Tool to Deliver or Practice Curriculum Content

Edtech, according to students, is most often about watching, reading, writing, and practicing. During both student interviews and observations, edtech predominately reflected entry level integration characteristics that coincided with these actions (Technology Integration Matrix, University of Florida, 2023), where students are passively receiving curriculum content through individual devices in ways that are unrelated outside of the instructional setting. Lana is frustrated by the fact that her teachers "don't teach anything that I'd actually use." This was specifically in reference to learning about photography, something she considers a hobby of hers and that she does not learn the applicable technology skills that would translate outside of the classroom: editing apps.

Barry, another student said, "a multiplication drill is still a multiplication drill, "but there's cars and stuff on the screen so it's sort of a race, but we're still just practicing." April had similar comments about Kahoot, the third most used edtech tool in a survey of 3.3 million educators and students (LearnPlatform, 2022, slide 8). She said, "maybe it's a little more fun than a worksheet, but it's basically still just a worksheet." This continues to represent a passive

delivery of content that merely replicates an existing drill at the lowest level of technology integration according to the technology integration matrix (TIMs, University of South Florida, 2019). It also represents a stark difference between what students want from edtech and what their teachers are choosing.

Students believe these online drills are chosen because teachers think it will be a more entertaining way of practicing. While it may be better than a worksheet, it is not considered by students to be effective towards learning the skills and does not meet their most common statement about edtech; that they want to learn using technology so that it can teach them to do things. In fact, of three statements about technology, students least identified with technology to entertain or to do things for them, and many were strongly against entertainment-based technology being used within the classroom at all (Table 5). April, an eight-year-old participant, described her classroom-based technology as "something that makes my teacher's life easier," noting that it was the most important criterion she believed was used in the selection process. Students' observations while using edtech were largely using a device to read a book, complete a drill-based game for a timed exercise, or to check their grades. While many students mentioned checking their grades, only middle school students performed this action at some point during the observations portion of the study.

Table 5

Edtech Statements

Which of the following statements do you feel most applies to you?	Number of responses	Percentage of responses

I like to use technology when I'm learning because it helps me learn how to do new things	11	92 %
I like technology when I'm learning because it does things for me.	0	0%
I like technology when I'm learning because it keeps me interested.	1	8%

Sub-Theme 3: Edtech as a Tool to Track Progress

Students agree edtech is a tool in their learning environment and most often to track learning progress. "We just use it to take tests," is a common sentiment expressed by more than 80% of the participants. Of those, half of the students say it could show grades and assignments that have been assigned. During the observation portion of the study, middle school participants were the only ones who navigated to a learning management system (LMS). This represents 42% of the participants. In a collection of the most accessed edtech sites from 3.6 million educators and students, LMS and IT management sites such as Google Classroom and Clever represented 17.5% of all sites (LearnPlatform, 2022, slide 2). By contrast, learning materials and supplies represented only 2.5% of the accessed sites (2022). Courseware platforms, such as IXL and I-Ready represented an additional 2.5%.

When asked about their expectations for classroom technology, students merely hope it turns on and that the internet works. Barry, a ten-year-old, was the only student that said he thought his teacher would expect them to learn with I-Ready, notably, a rephrasing of the question from its original intent of what *he* expected from edtech. He restated that I-Ready has lessons that could help him learn, but that his teacher does not utilize these. “We just use it to take the tests. The teachers expect us to learn from it, but we don’t.” During Alex’ observation, he used IXL, a courseware or supplemental curriculum that asks questions. I noticed during the observation that the beginning questions on a given topic had an option to “learn by example.” This was only clicked on once by the student. The result was a rapid click away from the example as several pages worth of text displayed with no audio or video options. During his interview, Alex said he expected IXL to have “better learning videos to explain things.”

Theme 2: Technology as a Means for Communication

Students see technology as a means for communication outside the learning environment. Eighty-three percent of participants mention the word “talk” or “communicate” when talking about their personal technology interactions (Table 6). They see *technology* as a means for communication, not *edtech*, though some students, like Alex and Anthony, listed it as a number one wish they had for their teachers to understand how much they want edtech to be an opportunity to collaborate. Anthony, a twelve-year-old participant, said communication is the most important feature for all technology. Other students expressed similar sentiments in the interviews with 83% identifying collaboration and 67% listening as action words that applied to their personal technology use. Similar data were seen in the coding themes during student interviews with 83% of students mentioning *talk* or *communicate* while discussing their personal technology interactions (Table 6). Seth said “there’s no way I would be such close friends with

Alex without technology. I also wouldn't have ever met Juan." Collaborate and listen as action words were chosen by 16%, or two students, though this same student chose every action word for both instances (Table 4).

Table 6

Coding Themes

Common words	Frequency	Participants	Edtech/Personal Tech
Build, make, create	24 occurrences by 75% of participants	Alex (5), Seth (4), April (2), Juan (5), Anabelle (1), Pete (1), Barry (2), Lana (3), Lucas (1)	Personal tech
Practice	38 occurrences by 92% of participants	Joseph (5), Jeremiah (3), April (6), Alex (2), Pete (5), Lana (1), Barry (5), Lucas (1), Seth (7), Juan (1), Anabelle (2)	Both
Assessment	9 occurrences by 50% of participants	Anthony (1), Jeremiah (2), April (1), Barry (2), Lucas (1), Anabelle (2)	Edtech
Tests	11 occurrences by 58% of participants	Joseph (1), April (2), Alex (1), Pete (2), Lana (1), Seth (1), Juan (3)	Edtech
Turn in assignments	7 occurrences by 50% of participants	Joseph (1), Jeremiah (2), Lana (1), Lucas (1), Seth (1), Anabelle (1)	Edtech

Track progress	6 occurrences by 50% of the participants	Jeremiah (1), Anthony (1), Anabelle (1), Joseph (1), Lana (1), Pete (1)	Edtech
Not learn, doesn't teach	10 occurrences by 58% of participants	Barry (2), Joseph (1), Anthony (1), Jeremiah (1), April (2), Alex (2), Juan (1),	Edtech
Learn, teach	11 occurrences by 33% of participants	Alex (3), April (1), Juan (4), Seth (3)	Personal tech
Talk, communicate	21 occurrences by 83% of participants	Joseph (1), Anthony (2), Alex (4), April (2), Pete (1), Lana (1), Barry (3), Lucas (1), Seth (2), Juan (4)	
Text	2 occurrences by 8% of participants	Anthony (2)	Personal tech

Sub-Theme 1: Technology to Communicate with Friends

Students believe technology should help them communicate with their friends. For Anthony, it increases his grit towards accomplishing a goal because he can "share it with friends." Fifty percent of students mentioned communication as important where friends or family have moved away and technology is how April keeps in touch with "uncles, cousins, and the people I care about. I also use my gizmo watch to talk to my mom." She, like two other students shared they have extended family living in another state. They each mentioned FaceTime as a tool they use to communicate with their family. Alex also uses Facebook

Messenger Kids to talk to his friends "if their parents have Facebook." Surprisingly, no students mentioned using social media during the study. Anthony was the only student to mention that he texted his friends. Two students mentioned having their own phone. It was more common for students to be seen wearing a smartwatch.

Sub-Theme 2: Technology to Play or Make New Friends

Students agree technology is a means to communicate, specifically in playing or working with friends. Every participant identified a gaming console as a technology they commonly interact with, with 83% also mentioning a personal device such as a personal laptop, iPad, or phone in their list of technology in their homes. Seth uses his Xbox to communicate he with his best friend and they "use it to build things, talk, and strategize all the time." His best friend lives in a different state and they became best friends by meeting online first through their parents. Alex, a nine-year-old who uses an iPad as his primary device, creates private servers to talk with existing friends and join public servers to make new friends. He shared that anyone is able to create private servers for no additional cost, each with their own world to build and play in, and that private servers are accessed by invitation only, providing a layer of security. Anthony, who values communication above all else, acknowledges the missed opportunity in using google suite in the classroom: "I wish we could collaborate with other students across classrooms and not just use it to make turning things in easier for my teacher." Jeremiah expressed a similar sentiment, but that all his teachers use it for is to "turn in assignments." The Google Suite (Docs, Slides, Drive, Forms, Sheets, Drawings) is the number one most accessed site according to a survey of millions of educators and students (LearnPlatform, 2022, slide 3). Google Classroom came in fourth overall. Overall, students from this study express a desire to use technology to communicate and schools around the country are utilizing the tool, but without all its features.

Outlier Data and Findings

An outlier to the data set can be seen in one student's action word choices where each word was circled for the two given scenarios: classroom and personal technology use. This means there are three action words that would otherwise not have been mentioned in terms of learning environment action words: collaborate, listen, and adapt. It should also be noted that nearly all students skipped the action word *adapt* indicating this may have been a poor word choice given the age of the participants. Students may not have understood what this word meant as many of the tools mentioned in both personal technology and edtech had adaptation capabilities. There were no other misaligned data points observed.

Research Question Responses

A central research question and three sub-questions are used in the study. These questions were created to understand what Gen Alpha learners expect out of edtech tool and how they rate their ability to develop passion and perseverance towards long-term goals with edtech enhanced instruction. Gen Alpha learners are the first generation born entirely within the digital age. They have not known a world without technology. It is possible that this heavy technological influence has shaped their expectations inside classrooms which remain largely low or nontechnical in nature.

Central Research Question

How do Gen Alpha learners describe technology expectations within their learning environments? Participants' perspective is that technology in their learning environment should be functional and perform basic drill or assessment activities. Rose said, "teachers don't really understand how to use it for anything else." Juan added that he believed his teachers were afraid of using technology because it was not as easy for them as it was for the students. When asked

which action words they expected to associate with technology in their learning environment, the top five words they chose were: watch (83%), read (100%), write (100%), practice (92%), and solve (67%).

Sub-Question One

How is the development of third through ninth grade Gen Alpha learners grit driven? Students grit is driven by incentives and their own sense of limitations. By a large majority, they will work towards a goal that has a reward, though it does not have to be physical. Lucas said "If it's for a grade, I'd work hard. I wouldn't work as hard for an end of the year test or anything." In terms of their limitations, students did not always agree on the same limitation, though most limitations were physical. April said, "I keep going until I get really hurt or break a bone," while other students said they would keep going as long as there was progress. Four students simply said they did not have a measure for when to stop working towards a goal: they keep going until the goal is reached, no matter what.

Sub-Question Two

How do Gen Alpha learners interact with edtech? All students in the study mentioned a Learning Management System (LMS) where they took quizzes, checked grades, or completed general practice, I-Ready being the most widely used. While all students chose the action word "read" and "write" as it relates to edtech, no students mentioned a reading or writing example when asked for specific technology in their classrooms. Math related programming was most common. Most notable was that students mentioned personal devices over teacher facilitated devices: no student mentioned a smartboard of any kind as a technology in their learning environment despite it being the primary expense in every classroom.

Sub-Question Three

How might the social norms affect how Gen Alpha learners rate their grit? Anthony said, "I'll work hard for something if I know I can show it off in the end to my friends." Middle school participants are more vocal in wanting their classroom technology experiences to translate outside of the classroom. Social norms outside the classroom include technology with networking, collaboration, and integrations between both hardware and software. None of these norms are mentioned in the context of classroom technology indicating they may not exist.

Summary

Students believe technology exists to help them, not do things for them. Their perspective is that teachers want it to do things for them and that teachers do not trust technology to help with learning. Edtech is seen as a tool in isolation; it helps a single student with single tasks in memory or practice. Technology outside the classroom is seen as something that makes or maintains social connections as well as entertains. The final interview question asked of students is if there is anything else about technology, they wish others knew, be it friends, family, or teachers. The most common theme was that they wish the adults in their lives saw the good in technology and not the bad. "That just because one kid looked up something bad on the internet, doesn't mean the internet is bad," said Barry. April said she wanted her teacher to know that she would not misuse the mouse during computer time even though "one student misused it one time in the beginning of the year." She shared her frustration for capital punishment and "now none of us can use one ever again." A few students expressed that they think the teacher is against technology because they think all technology is a social media thing. Only 50% of students said they use technology to research in the classroom. Overall, students want technology to help them

learn and they want teachers to show them how to use it better, but they do not expect their teachers to be willing or able to do this.

CHAPTER FIVE: CONCLUSION

Overview

The purpose of this exploratory case study is to understand the expectations Gen Alpha have with edtech in learning environments and how those students may subsequently rate their grit. There has been some evidence that what educators choose as technology is to entertain or engage students rather than assist towards learning (Garavaglia et al., 2012; Januariyansah & Rohmantoro, 2018; Weninger, 2018). How students define their expectations, that technology is a tool to assist, does not align with what they expect out of edtech. Students are increasingly disengaged (Gradient Learning Poll, 2023; Hodges, 2018) and teachers are more burned out than any other industry (Gallup Poll, 2022), yet not optimistic about personalized learning with technology (Education Week Research Center, 2019; Klein, 2019). This chapter will explore the interpretations of the data, specifically in how it may affect their grit within the classroom in the absence of technology or technology at the same level of expectations outside of the classroom. I will also explain the implications for policy and practice for parents because of the study results. The theoretical context of the study, that of grit theory by Angela Duckworth (2022), is further expanded and supported considering technological social norms for Gen Alpha students. There are limitations of the study to be examined. This includes some students being unable to complete the observation with their edtech tool as it was not allowed off school premises for certain age groups which fundamentally changed the homework assignments that are part of the study. Delimitations included specific age ranges for the participants and the choice of home over school learning environments to be further examined in this chapter. Finally, I will make recommendations for further research on students with edtech.

Discussion

The purpose of this exploratory case study was to understand the expectations Generation Alpha (Gen Alpha), those born between 2010 and 2024, has on educational technology (edtech) in learning environments and how those students rate their grit with 12 participants in third through ninth grade. The reality is that the two worlds exist so separately with so little meaningfully integrated technology in the classroom (Blasko et al., 2022; Forkosh-Baruch et al., 2021). The social norm that may be influencing the classroom is that classrooms, at least according to students, are lacking meaningful technology and that the technology that persists does not focus on learning or communication between their peers (Timotheou et al., 2022). Given the monetary commitment each year and the number of tools educators are using, it is not resonating with students (Timotheou et al., 2022). The interpretation of findings will further delineate why this may be the case by looking at the two main themes: technology as a tool to help and technology as a means for communication. In both cases, edtech is below par for what students expect in these two areas that are so meaningful and powerful in their personal lives or their lives outside of the classroom. Implications for policy and practice, outliers in the data collection, and the theoretical and empirical implications will be discussed. Further research should be done in edtech, perhaps in classrooms or with many of the prevailing courseware or study tools mentioned by students such as I-Ready, Google Suites, or other learning management systems.

Summary of Thematic Findings

The first interpretation can be that students see technology as something that innovates and can help them and their world. It enhances their lives by allowing them to meaningfully create, collaborate, and solve as active participants alongside of passive entertainment to watch

or listen to content. The second interpretation is that edtech is not authentic technology to the Gen Alpha generation. It does not enhance their learning environment as much as it makes things easier for their teacher and passively delivers content to read, watch, or practice drills that would be essentially the same on paper. McGrath and Åkerfeldt proposed that this is the difference in digitization and digitalization (2019). According to the researchers, digitization is the "evolutionary process of replacement," such as a keyboard to replace paper and pen, or Kahoot to replace written quizzes or worksheets (2019). Conversely, digitalization is about the transformational practice of learning with digital tools. It asks questions such as "What does the digital tool afford the teacher and the learner that the analogous version did not?" and "How can the digital tool enhance learning?" (McGrath & Åkerfeldt, 2019). Participants described the *digitalization* of their lives while describing the *digitization* of their classrooms. The final interpretation is that Gen Alpha views technology as something that brings collaboration and unity, while edtech creates isolation. Each of these will be discussed in the content of the data collection methods used.

Interpretation of Findings

There are two main themes that emerged from the data collection. First, technology as a tool to help is supported by students believe that technology is an innovative tool to facilitate higher-order actions otherwise impossible without technology. This contrasts with students' perception of edtech, an entry level tool used minimally to passively deliver curriculum content or track progress. April suggests this is because teachers do not "really use or even like technology." She also does not feel teachers use it in the classroom for learning and instead, only use it for "diagnostic and growth checks" with assessments. Barry, a ten-year-old, said, "I don't really expect anything" when it comes to edtech. The lack of expectations may be why some

students, like Lucas, do not work as hard. “I wouldn’t work hard for an end of the year test or anything,” he said. Others feel technology in the classroom does not connect with anything outside the classroom. The second theme that emerged from the data is that Gen Alpha students use technology as a means for communication, both to communicate with friends or to play or make new friends. Three significant interpretations can be made from these emerging themes.

Technology Innovates: Digitalization

Students describe their personal technology choices as things that fundamentally change their lives. They use it in their lives to do things otherwise not possible. “It should be easy to use,” according to Lana. Many, like Seth, Juan, and Alex, want the war between operating systems to end and integrations to improve. Alex wants to use technology to “help me do things.” He also clarified that “technology isn’t going to do anything for me” when asked about why he likes technology. Gen Alpha is always looking for more: More that technology can do, more content that it can deliver, and how it can be easier and more intuitive. McGrath and Åkerfeldt describe this as technology as a global content provider (2019). To students, it includes complex problem solving with advanced gaming, world building across multiple scenarios, and personalized entertainment experiences.

When given a choice of three statements, all but one participant most identified with the statement that they like to use technology when learning because it helps them learn how to do new things. No students felt this happens in the classroom, despite all students having individually issued Chrome books. The Technology Integration Matrix, a tool commonly used to evaluate the adoption of technology in the classroom by educators, defines the transformative level, the highest level of technology integration, as the encouragement of “technology tools to facilitate higher-order learning activities that may not be possible without the use of technology,”

(TIM, University of South Florida, 2023). It includes active participation by the student that can be both extensive and unconventional. How students have learned to create their own servers for specific purposes across multiple worlds, each with their own set of coded logic in Minecraft and Roblox, is a truly transformational experience. It includes extensive strategizing with others to be successful towards a common goal. Using editing applications to transform raw videos is another form of transformation that would otherwise be impossible without technology. Rather than playing an isolated board game at the family table, many participants opt for immersive experiences that strategize as teams across an ever-changing board, made possible with technology in ways physical board games cannot replicate. Still, several students want more. They expect more personalization, more advanced settings, more accessibility controls, and more inclusive environments. They want to be both the consumers and producers of their entertainment and no longer are content to passively receive information.

Innovative technology allows goal setting with planned activities, monitoring, evaluation of results, and reflection. Many of the games and activities described by the youngest of the student participants included each of these components, though nearly always in an immersive, game-like interface. In-game awards and achievements are common measures of success, as is the ability to share in a collaborative win, something mirrored by many participants when discussing what makes them grittier. Knowing there is a reward for completing a milestone was the most common theme amongst participants when asked what would make them have higher grit. It could be a carry over to a social norm created by patterns in their technology use that translate outside of their games and into their very real goal setting live

Edtech is not authentic technology: Digitization

When students describe technology in their personal lives, either from social norms or their own preferences, it comes with high expectations and complex requirements. When asked the same question in the context of their learning environment, there are only low expectations and simple requirements, if any, indicating that edtech is not authentic technology to them. They refer to the replacement of physical artifacts and worksheets into a digital copy.

April critiqued one of the most widely used edtech tools, Kahoot, and said, "maybe it's a little more fun than a worksheet, but it's basically still just a worksheet." Later she added, "You don't learn with it." According to the Technology Integration Matrix, reproducing the same drill on a computer interface without changing or enhancing it, is among the lowest levels of integration possible (TIM, University of South Florida, 2023). Alex, a nine-year old that is enrolled in an online school, listed all the things he thinks edtech *should do* to meet his standards. This includes full integration with gaming interfaces for brain breaks or as incentives because "they need to stop trying to make games when they're not good at making games. IXL makes learning stuff. They should stick to that." He also listed personalization, ways to reduce clicks to accessing content, improved curriculum videos, and thematic releases around holiday breaks to encourage logins.

Most students said they just hoped the technology their teacher chose would turn on and that the internet would work. Jeremiah, a middle school student, said he only uses technology in the classroom to turn things in or take tests. When asked what he considered the most important edtech in the classroom, he said "nothing. There's nothing I'd consider important." Similar to Barry's non-existent expectations because he has "done the same things a lot." He also said some of the edtech choices are not age appropriate, specifically critiquing the reading tool chosen by his teacher. According to Barry, it "doesn't have any books" he likes and is a better fit for

younger students. The same criterion they use in selecting their own technology is not reflected in any of the teacher or district choices. Nor are educators using interactive whiteboards to their full capacity to allow students to share in the learning. In a study of the implementation of interactive white boards amongst teachers, they did not use the saving or sharing content created on the interactive white board with learners and instead opted to use the very expensive equipment as a traditional blackboard (McGrath & Åkerfeldt, 2019). The average cost for one classroom interactive board is between $6,000 and $10,000 (Hazen, 2023). Using one as a traditional whiteboard suggests a replacement of the equipment from an old analogous problem; switching paper gradebooks to digital record keeping, or keyboards for pen and paper are examples of digitization but not digitalization (McGrath & Åkerfeldt, 2019).

With such a stark contrast between personal technology choices and edtech, a new social norm can be identified: that schools are not providing authentic technology that helps students learn to their populations. They are digitizing records and practices, but not digitalizing classroom environments. This is despite the investment in hardware, such as personal computers for every student and smartboards for every classroom, and in software programs, an estimated annual cost between $26 billion and $41 billion before the pandemic (Edtech Evidence Exchange, 2021). In a review of the top 40 edtech solutions accessed by students and educators, half are quiz or drill programs, 28% are an LMS or conferencing tool, and the first learning focused option is 18th on the list, behind YouTube, Wikipedia and CoolMath Games, something Barry mentions as having “no learning games at all” (LearnPlatform, 2022, slide 3). This report aligns with what students are saying; technology in the classroom is about assessments, assignment management, and passively receiving content. In order of highest use to deliver passive content are YouTube, Wikipedia, Encyclopedia Britannica, NYTimes.com, History

Channel, Epic!, and Scholastic. They may represent the sites used for research; an action word claimed by 50% of participants, but they are not immersing students in a learning experience or helping students learn to do new things with their technology. There is no transformative value at all in these top sites.

Edtech is not being used for learning purposes often enough in classrooms, despite an average of 143 unique edtech tools being accessed by students each year and the frustration can be seen from both educators and students. Educators who largely prefer not to use technology are accessing 148 unique edtech tools each year (LearnPlatform, 2022, slide 2), and cannot be receiving proper training to utilize this number of tools. Only 2.5% of these are learning materials. An additional 2.5% is categorized as courseware (2022). Courseware examples include self-paced student learning paths seen in IXL, I-Ready, or Study Island. Educator burnout continues to climb with as many as 44% reporting being burned out often or always (Gallup Poll, 2022). This burnout is the highest across all industries, higher than healthcare workers, lawyers, community, and social services even during COVID-19. At the same time, 50% of students are saying they are not engaged in what they are learning most of the time, and 80% of teachers are concerned in their students' engagement (Gradient Learning Poll, 2023). This aligns with this study's student observations while completing homework, with 50% displaying low eye contact, focus, or follow through and the low utilization of technology. In the same report, teachers identified the number one cause of disengagement as a lack of intrinsic motivation and the second that 63% of students need skills to self-direct the learning process. They *know* students need to direct their own learning but are denying the opportunity afforded by edtech if integrated meaningfully through transformative opportunity (TIM, University of South Florida, 2023). They do not need more quizzes. They do not need more learning management

systems (LMSs) or informational technology systems (IT) to manage assignment workflows. The fact that LMSs and IT systems represent 17.5% of the top 40 most accessed edtech sites compared to just 2.5% of learning materials shows there is not enough focus on edtech for *learning* (LearnPlatform, 2022, slide 2).

Technology connects while edtech isolates

Participants expressed a norm amongst technology outside the classroom as a means to connect with peers, friends, and family. This is in stark contrast to previous studies that say Gen Alpha are less social than previous generations and interact more with Alexa or Siri (voice assistants of Amazon and Apple) than their parents or friends (Jha, 2020). By their own descriptions, they crave social interactions and feel stunted by the adults in their lives, to communicate with friends via technology. Seth, who participated in the study virtually said he does not have any boys in his neighborhood. Technology is how he connects with his friends, yet he is frustrated by the screen limitations imposed on him by his parents that limit these interactions. Anthony and Anabelle, the only students to identify a personal phone as one of the technologies in their home, both described it as a tool to communicate. Barry also said he uses technology to keep in touch with friends when he travels with family. The recurring theme of technology as a tool to connect was clearly articulated by students with each question that related to the research question on how Gen Alpha interacts with technology.

Some students, particularly middle school students, want the same connected experience in the classroom. Individualized learning solutions identified by participants such as IXL and I-Ready are not yet advanced enough to allow for collaborative learning within the technology. As someone who has worked in the edtech design space, I can attest that it is not a consideration for any learning solutions in the near future, either. The technology exists, but the marketplace, that

is the educators and district leaders with purchasing power, are not interested in collaborative learning solutions. However, some tools exist that have the opportunity for collaboration. According to Anthony, this opportunity is being missed. Anthony sees the opportunity with common tools such as the Google Suite, Google Classroom and Google sites, all in the top five most used edtech solutions by educators and students (LearnPlatform, 2022, slide 3).

Instead of edtech allowing for the same collaboration Gen Alpha has grown accustomed to in their daily technology-enhanced lifestyles, edtech is nearly always isolating, preventing connections between students and classrooms. At best, leaderboards are created, but even these with so many layers of protections and pseudonyms, it would be impossible for any student to consider it a collaboration or networking feature between their peers. Despite concerns for the protection of privacy being prevalent across digital industries, gaming communities have enabled complex networking and collaboration tools.

Implications for Policy or Practice

Educational policy is slow to change. However, with the right information, I believe parents, district leaders, and teachers can bring about transformational policies. First, purpose-driven training needs to be a priority for educators to understand how to meaningfully integrate technology. This is a shift from the transactional or functional trainings that focus on how to use the features, but not why. School policy should enforce more trainings for educators through additional credits options, in-service trainings, or mentoring within the district by transformational teachers.

Second, more visibility needs to occur in educational practice. Given the funding of edtech, both in terms of digital products and physical equipment in classrooms and with individual students, there needs to be accountability as to how it is being integrated. Teachers

may be at different levels of readiness and knowledge to implement technology effectively, but progress must be made and visibility must be present to both district leaders and parents.

Implications for Policy

First, an implication for policy is in the need of professional development or training to use edtech. If 148 unique edtech tools are being accessed each year by educators, teachers need more training. On the job training, the responsibility of schools and districts once hiring a teacher, is challenging with teacher unions restricting the number of hours and days outside of the school year to require attendance and with the limited number of noninstructional hours during the school year. Trainings should be reconfigured for effectiveness with technological solutions in mind (Buchanan, 2020).

For that reason, the first policy change I recommend is at the institutional level: colleges, universities, and continuing educational courses for teachers to be, that is those working towards certification. Future educators should be exposed to the most recent studies on student engagement, edtech, and engagement studies in learning environments with students, not just educators. Currently, many of these classes are only offered at the master's or PhD level. In the state of Colorado, Professional License holders are those who have graduated as an educator, must complete the equivalent of 6 semester hours every seven years (Colorado Department of Education, 2024). A course should be mandated specifically in implementing edtech, given the gaps in understanding, the sheer number of edtech products used, and the monetary commitment each year towards edtech.

Parents should also advocate for more meaningful edtech integrations that align with the Technology Integration Matrix. Increased visibility into what edtech is being used for the classroom and for what purpose would increase the sense of community between parents and

educators as well as allow for a more supportive environment for student learning. A teacher letter at the beginning of the year on what edtech the classroom will be using and for which purposes would go a long way in having parents support the teacher with allowing for some screen time or sick days to be utilized on the same edtech. Parents taking their students out of school early for skiing, for example, would be able to support the classroom learning by utilizing the same edtech tool on their own devices or with school issued devices during the time away.

Increased accountability as a policy change for meaningful edtech may also have the added benefit of changing the increasing phenomenon of disruptive student behavior and active disengagement (Hodges, 2018). With 46% of teachers not feeling optimistic or positive of personalized learning (Education Week Research Center, 2019), it is imperative they receive more information and more training through educational policy. Educators should be made aware that sites like Kahoot are not as impactful as they may first seem. Students see these as more quizzes, more ways to assess, instead of helping them learn new things. Technology outside the classroom has adapted so much with edtech lagging far behind and students see the difference in experiences.

Implications for Practice

Five schools across four districts were included in this study. The information gained from student interviews, observations, and questionnaire revealed a gap between technology in learning environments and technology outside of learning environments that may transfer to all districts. Elementary students had less technology integrations than middle school students and were particularly disillusioned with the school's ability to translate technology instruction into meaningful learning. This may apply to all elementary students. While it was true that Gen Alpha students of these five schools were not experiencing integrated technology in their

classrooms, it may also apply to all elementary and middle schools. Improved visibility into what edtech tools is being used for and why, including criterion for the selection process, should increase accountability for educators across districts as an improved practice for edtech. Districts should be aware of what educators are accessing in the classroom and how funding for edtech is actually being allocated. Many may not be aware of the miniscule amount being used for learning or the impression current technology practices are leaving with students. Two and a half percent of edtech being focused on learning is simply not enough (LearnPlatform, 2022). It should also be concerning for district leaders and parents to hear some of the statements made by students about the lack of useful edtech despite all the funding for edtech being pushed into classrooms.

Theoretical and Empirical Implications

The theoretical context of the study explored previous studies of a positive relationship between engagement, academic achievement, and grit (Bozgun & Akin-Kostereliglu, 2021; Duckworth et al., 2007; Hodge et al., 2018). The empirical context of the study explored the perception of students versus their teachers of edtech (Weninger, 2018) and the observation of grit as moderately correlated with performance and retention (Credé et al., 2017). According to Credé et al. (2017) interest played a more significant role in success than grit. Similar observations were seen from student interviews and the grit questionnaire in this study. The theoretical implications to compare were Kolb and Kolb's (2009) theory of learning as a process of creating knowledge through experience and the idea that grit should be combined with motivation or engagement to determine success (Bozgun & Akin-Kostereliglu, 2021; Hodge et al., 2018). Much of the previous research has been done with high school students (Bozgun & Akin-Kostereliglu, 2021; Credé et al., 2017; Duckworth et al., 2007; Hodge et al., 2018;

Weninger, 2018) whereas this study was conducted with Gen Alpha, extending the previous studies to include a generation that had never been without technology.

Empirical Implications

Previous empirical research studies were largely observations in high school classrooms with seemingly integrated edtech where the focus was to understand if there was a gap between what students and their educators considered authentic edtech instruction (Credé et al., 2017; Weninger, 2018). In Weninger's study, students had much narrower definitions of edtech than their educators. One example is that educators believed digital PowerPoint presentations were authentic edtech while students did not. In my study, students did not specifically mention PowerPoint as a tool their teachers used, but they did reference that the teacher's digital boards should be recorded and shared out as a study tool or for those unable to attend in person. Barry, who often travels with his family said it was a great opportunity for students to see what was done in class and how it was done. These findings are similar in that students are still feeling edtech is not authentically integrated or utilized in their classrooms to the extent the technology is able to be used. Anthony, a middle school student who puts communication as a top requirement for choosing all technology, said his teachers are missing an opportunity by not using any of the collaborative tools in the Google Suite software. Teachers still print papers and handwrite corrections for the students instead of utilizing the comments or editing features. He also feels he could collaborate with peers by playing the role of an editor for classmates prior to turning papers in that would improve his work and his effort. In his words, "if I knew others were going to see it, I'd work harder," said Anthony. Eight out of twelve students in the study scored at least 3.5 out of 5 for grittiness. In student interviews, many said they are more likely to have higher grit if there is an incentive or reward behind the completion of the goal, something

they cited as common in their technology practices outside of school. This may indicate a social norm that is affecting their ability to persevere in classroom situations when they do not have access to responsive, immersive, or goal oriented edtech.

Researchers from Weninger's study also believed there had been a shift from re-envisioning curriculum with an emphasis on preparing students to stay relevant when it came to their real world and technology to valuing print-based curriculum designs (Weninger, 2018). This study aligns with the findings amongst Gen Alpha students who express a desire for technology to assist them towards learning, not to entertain and not to do things for them, much like the participants in Weninger's study (2018). Alex said, "technology won't do anything for me. I have to know how to use it." Now a fourth grader, he used to attend a private school that did not use technology where he felt he was unable to learn as a result. As a student of an entirely digital school, he feels he has the tools to succeed, though they could, and in his opinion should, be much better than they are. In his opinion, too many products are trying to make things themselves instead of collaborating with experts. He specifically referenced what his teachers called "brain breaks," time spent doing something non-academic, like games, after completing a set of challenging questions. According to Alex, Study Island is guilty of trying to create their own games that are subpar and so easy that it does not feel rewarding to play. He prefers IXL, a comparable digital curriculum delivery program that has no games and more intuitive progress metrics. These findings are consistent with Weninger's study that showed a shift in print-based and passive curriculum design over current technology trends or learning that transitioned outside of the classroom (2018).

Students in this study were more adamant that their teachers or schools did not want technology in the school than previous studies, seemingly showing an extension of the gap

between students and teachers when it comes to technology and how to use it. April believed her teacher did not "really use or even like technology" and that her teacher's most valued technology was a laser pointer. It was a theme, carried through by many, that teachers did not like technology nor know now to authentically integrate the most critical components of technology into instruction. This included technology as a tool, as a way to communicate, and as a way to create. Most students expressed their teachers chose technology to entertain or replicate worksheet-based tasks online. According to the Technology Integration Matrix (TIM) replicating existing tasks digitally is the lowest level of technology integration and yields the lowest results (TIM, University of South Florida, 2023). It is a form of digitizing, not digitalizing instruction. Compared to previous research, my study highlights the same stark gap in how students versus their teachers classify edtech and believe in utilizing edtech in learning environments.

Previous studies focused on older students, those that were born in the late 1990s or early 2000s while technology was still developing (Credé et al., 2017; Weninger, 2018) and not nearly as pervasive as it is for Gen Alpha, born entirely within a digital world. This new perspective extends the research, contributing to an entirely new generation of learners, not previously studied. Credé et al. (2017) observed grit as perseverance and passion, but found self-efficacy, or the belief that an individual's belief in their own capacity to execute behaviors necessary to attain success (Bandura et al., 1996) or interest was a stronger predictor of achievement. While my study was not focused on achievement, some students exhibited similar beliefs that they had the potential for success within themselves. They believed they had so much more potential to learn with technology than their teachers were willing to allow. Anthony specifically said he believed his teachers were "alright" with failing technology and that he could have done so much better if he was able to use the existing technology as it was designed. Joseph, like many, saw

technology as a way he could have learned, but that his teachers chose to only use it for assessment. Credé et al. (2017) found that interest related to perseverance of effort more than grit. Students in this study expressed a high interest in technology as a tool and believed they could solve more problems with technology than without it, giving a similar viewpoint.

Theoretical Implications

Kolb and Kolb (2009) theorized that learning was a process of creating knowledge through experience. Others theorized that grit alone was not a predictor of achievement as much as motivation or engagement with grit was (Bozgun & Akin-Kostereliglu, 2021; Hodge et al., 2018). As a part of my study, students were given a list of 11 action words to attribute to their technology choices, first personally, then to technology in their learning environments. Overwhelmingly, students selected the words ‘create’ as something that occurs in their personal technology choices. In the student interview portion of the study, many used the word ‘build’ when asked about technology they wanted in their learning environment. If Kolb and Kolb (2009) were correct that learning is a process of creating knowledge, this new study challenges instruction in that they do not believe they are able to create or build in their learning environments. This suggests students are less able to create in their learning environment, leading to less experiential learning opportunities and thereby may be impacting achievement despite being rather gritty students. Notably, national student achievement scores are at an all time low (Carrillo, 2023; National Assessment of Educational Progress, 2023) with increasingly disengaged students, despite 80% of teachers being concerned with their students’ engagement (Gradient Learning Poll, 2023). Perhaps the results of this study are transferrable in that students are unable to find ways to engage with their learning environments given the wide gap between their expectations of edtech and what the realities of their classroom edtech.

In Bozgun and Akin-Kostereliglu's study (2021) they theorized grit alone was not a reliable predictor of higher achievement as much as grit and motivation were predictors. While achievement was not a direct interest in this study, students consistently mentioned they felt they would have higher grit if they had a reward. Many students expanded their thoughts when discussing their personal technology choices. They described games with rewards or point-based systems, and achievements as a key motivating factor. Pete and Alex were among many that expressed frustration that none of the same design concepts were included in their personal learning paths for school.

Overall, the theories of grit and experiential learning were largely supported by the findings of this study in the specific area of technology. Students want to be motivated and believe they can achieve more when rewards are given. They consistently find this as a part of technology in their personal designs and want to see the same in edtech. The empirical implications also align in that there is a persistent gap between students and their teachers in their learning environment, specifically in the level of technology integration. However, it would seem the gap is widening as Gen Alpha are more exposed to technology in their daily lives and less likely to understand low-tech or no-tech paradigms.

Limitations and Delimitations

There were limitations and delimitations as a part of this study. All students had been issued personal chrome books by their school districts. A delimitation was that three students were not allowed to bring those chrome books home, meaning teachers were unable to assign edtech activities consistently. Observations were conducted while they completed reading homework assignments with books from home instead of an edtech activity meaning their results were slightly varied from their counterparts. A limitation of the study was the pool of volunteers

was predominately male. Only two eligible female participants volunteered and were ultimately selected for the study resulting in a predominately male study that may have different results than an evenly balanced representation.

An intentional limitation of the study was an age restriction. Previous studies were largely conducted amongst older students, high school, or college. To add to the body of research, I intentionally chose a younger age group that is also more native to technology and perhaps more influenced by it. Participants ranged from eight to twelve years old.

Recommendations for Future Research

Future exploratory case studies should be conducted to continue to build the body of research on what we know about edtech and Gen Alpha. The goal is to build edtech products that are better suited to the learning needs of these unique and rather gritty students that have largely disengaged from today's classrooms. These studies should continue to push into classrooms in various settings with Gen Alpha age groups. Students want edtech to contain more motivators, more achievements for progress. Additional research should be done to understand these ideas. There are public schools, magnet and charter schools that are more focused on technology integrations, and hybrid schools that offer online academics while also providing sports instruction. These hybrid schools do not even have an educator on site and instead have technology advisors that monitor progress through various digital offerings that could provide critical insights into building better integrations across products for better learning solutions.

Together, these exploratory case studies could gather insights against a wider range of digital curriculum edtech solutions. Future studies should continue to be qualitative studies that work directly with students through observations and interviews. While educator input is important, it varies greatly from student data collection. Rural and urban locations of these

school settings would also further the topic of edtech. The purpose should remain the same: to understand how Gen Alpha students interact with edtech and if their social norms or expectations of technology outside learning environments affect how they rate their grit.

Conclusion

Gen Alpha students have been immersed with technology. They do not know a world without technology being integrated in nearly all aspects of their lives and so have high expectations and near limitless opinions of how to improve even the most advanced edtech solutions. With more than half disengaged from their classrooms (Gradient Learning Poll, 2023; Hodges, 2018), another thirty percent a concern for teachers (Gradient Learning Poll, 2023), and literacy and math competency rates at their lowest rate in decades (Carrillo, 2023; National Assessment of Educational Progress, 2023), learning environments must change.

Nearly half of teachers do not feel optimistic about personalized learning (Education Week Research Center, 2019). Forty-four percent are burned out most or all the time (Gallup Poll, 2022). Policies need to change to support educators with on-the-job training to use any one of the 148 edtech tools they use each given year (LearnPlatform, 2022, slide 2). Institutions need to change practices to better equip teachers. Edtech products need to improve. They need to be more collaborative and more focused on delivering immersive content and shift away from passive content delivery and assessments. Classrooms should be *digitalized*, not just digitized.

With more research on how Gen Alpha students engage with edtech, better designed edtech geared towards immersive and experiential learning, and educators that can meaningfully integrate technology into their classrooms, transformation can occur. Hopefully it will alleviate the burnout, the disengagement, and align gritty students with meaningful learning.

References

ABC Mouse. (2022). What are tickets and how are they used? https://support.abcmouse.com/hc/en-us/articles/360048194433-What-are-Tickets-and-how-are-they-used

Adobe. (2016). Gen Z in the classroom: creating the future. *Independent Study*. http://www.adobeeducate.com/genz/adobe-education-genz

Adventure Academy. (2022). What are the currencies of Adventure Academy? https://support.adventureacademy.com/hc/en-us/articles/1500004964701-What-are-the-currencies-of-Adventure-Academy

Aguirre-Muñoz, Z., & Pantoya, M. (2016). Engineering literacy and engagement in kindergarten classrooms. *Journal of Engineering Education, 105*(4), 630-654. https://doi-org.ezproxy.liberty.edu/10.1002/jee.20151

Akman, A., & Cakir, R. (2020). The effect of educational virtual reality game on primary school students' achievement and engagement in mathematics. *Interactive Learning Environments*. https://doi-org.ezproxy.liberty.edu/10.1080/10494820.2020.1841800

Al-Balushi, S., Ambusaidi, K., Al-Balushi, K., Al-Hajri, F., & Al-Sinani, M. (2020). Student-centered and teacher-centered science classrooms as visualized by science teachers and their supervisors. *Teaching and Teacher Education, 89*(1). https://doi.org/10.1016/j.tate.2019.103014

Attard, C., & Holmes, K. (2020). "It gives you that sense of hope": An exploration of technology use to mediate student engagement in mathematics. *Heliyon, 6*(1). https://doi.org/10.1016/j.heliyon.2019.e02945

Bandura, A., Barbaranelli, C., Caprara, G., & Pastorelli, C. (1996). Multifaceted impact of SE beliefs on academic functioning. *Child Development, 67*(3), 1207-1222. https://doi.org/10.2307/1131888

Bardone, E., Tonni, T., & Chounta, I. (2020). The educational technologist as a variety-handler. *Education and Information Technologies, 25*, 4015-4040. https://doi.org/10.1007/s10639-019-10091-5

Beck, L., & Wright, A. (2019). iGen: What you should know about post-Millennial students. College and University: Washington. 94(1), 21-26.

Bergdahl, N., Nouri, J., Fors, U., & Knutsson, L. (2020). Engagement, disengagement and performance when learning with technologies in upper secondary school. *Computers in Education, 149*, 1-17. https://doi.org/10.1016/j.compedu.2019.103783

Blasko, C., Costa, P., & Schnepf, S. (2022). Learning losses and educational inequalities in Europe: Mapping the potential consequences of the COVID-19 crisis. *Journal of Europaen Social Policy, 32*(4), 361-375. https://doi.org/10.1177/09589287221091687

Blundell, C., Lee, K., & Nykvist, S. (2020). Moving beyond enhancing pedagogies with digital technologies: Frames of reference, habits of mind and transformative learning. *Journal of Research on Technology in Education, 52*(2), 178-196. https://doi.org/10.1080/15391523.2020.1726235

Bond, M., Buntins, K., Svenja, B., Zawacki-Richter, O., & Kerres, M. (2020). Mapping research in student engagement and educational technology in higher education: A systematic evidence map. *Journal of Educational Technology in Higher Education*, *17*(2), 1-30. https://doi.org/10.1186/s419-019-0176-8

Boyatzis, R. (1998). Transforming qualitative information: Thematic analysis and code development. *Sage Publication, Inc.* https://psycnet.apa.org/record/1998-08155-000

Bozgun, K., & Akin-Kostereliglu, M. (2021). The roles of social-emotional development, academic grit, and subjective well-being in primary school students' reading-writing motivation. *Reading Psychology, 42*(8), 836-857. https://doi-org.ezproxy.liberty.edu/10.1080/02702711.2021.1955782

Breiter, A., & Light, D. (2006). Data for school improvement: Factors for designing effective information systems to support decision-making in schools. *Educational Technology & Society, 9*(3), 206-217. https://www.jstor.org/stable/jeductechsoci.9.3.206

Buchanan, R. (2020). Through growth to achievement: Examining edtech as a solution to Australia's declining educational achievement. *Policy Futures in Education*, *18*(8). https://doi.org/10.1177/147821032091

Carrillo, S. (2023). U.S. reading and math scores drop to lowest level in decades. *NPR Education*.

Casula, M., Rangarajan, N., & Shields, P. (2021). The potential of working hypotheses for deductive exploratory research. *Quality & Quantity, 55*, 1703-1725. https://doi.org/10.1007/s11135-020-01072-9

Chism, S., & Wilkins, E. (2018). Student ownership for blended physical education. *Kappa Delta Pi Record. 54*(4), 158-164. https://doi-org.ezproxy.liberty.edu/10.1080/00228958.2018.1515543

Chou, P. N., Chang, C. C., & Lin, C. H. (2017). BYOD or not: A comparison of two assessment strategies for student learning. *Computers in Human Behavior, 74*(1), 63-71. https://doi.org/10.1016/j.chb.2017.04.024

Cilliers, E. (2021). Reflecting on social learning tools to enhance the teaching-learning experience of Generation Z learners. *Frontiers in Education*. *5*(1). https://doi.org/10.3389/feduc.2020.606533

Cirilli, E., Nicolini, P., & Mandolini, L. (2019). Digital skills from silent to alpha generation: an overview. *Edulearn19: 11th International Conference on Education and New Learning Technologies.*

Colorado Department of Education. (2024). Renewal of a Colorado professional license. https://www.cde.state.co.us/cdeprof/licensure_renewal_info

Colliver, Y., Hatzigianni, M., & Davies, B. (2019). Why can't I find quality apps for my child? A model to understand all stakeholders' perspectives on quality learning through digital play. *Early Child Development and Care, 190*(16), 2612-2626. https://doi-org.ezproxy.liberty.edu/10.1080/03004430.2019.1596901

Credé, M., Tynan, M., & Harms, P. (2017). A meta-analytic syntheses of the grit literature. *Journal of Personality and Social Psychology, 113*(3), 492-511. https://doi.org/10.1037/pspp0000102

Cutler, N., Halcomb, E., & Sim, J. (2021). Using naturalistic inquiry to inform qualitative description. *Nurse Researcher*, *31*(3). 10.7748/nr.2021.e1788

Denver Public Schools. (2019). Family satisfaction and engagement survey. Whittier and University Prep at Arapahoe. https://assessments.dpsk12.org/family-student-surveys/

Du Plessis, N. (2011). *Social media in higher education: The case of Facebook.* Vanderbijl Park.

Duckworth, A. (2022). Research: Grit scales. https://angeladuckworth.com/research https://angeladuckworth.com/research/

Duckworth, A., Peterson, C., Matthews, M., & Kelly, D. (2007). Grit: Perseverance and passion for long-term goals. Journal of Personality and Social Psychology, 9, 1087-1101. http://www.sas.upenn.edu/~duckwort/images/Grit%20JPSP.pdf

Education Week Research Center. (2019). Personalized learning survey. 1-31. https://epe.brightspotcdn.com/5c/f0/8e6844d94ac586c2f70399085aa9/personalized-learning-national-survey-education-week-research-center.pdf

Eduniversal Evaluation Agency. (2019). Generation Alpha: An ieducation for an igeneration. https://www.eduniversal-eea.com/news/Generation-alpha-an-ieducation-for-an-igeneration.html

Edtech Evidence Exchange. (2021). U.S. K-12 public education technology spending. https://edtechevidence.org/wp-content/uploads/2021/07/FINAL-K12-Edtech-Funding-Analysis_v.1.pdf

Fabian, K., Topping, K., & Barron, I. (2018). Using mobile technologies for mathematics: Effects on student attitudes and achievement. *Educational Technology, Research and Development, 66*(5), 1119-1139. http://dx.doi.org.ezproxy.liberty.edu/10.1007/s11423-018-9580-3

Frankenfield, J. (2020). What is Edtech? *Investopedia*.

Franklin, R., & Smith, J. (2015). Practical assessment on the run-iPads as an effective mobile and paperless tool in physical education and teaching. *Research in Learning Technology, 23*(1), 27986. http://dx.doi.org.ezproxy.liberty.edu/10.3402/rlt.v23.27986

Fantozzi, V., Johnson, C., & Scherfen, A. (2017). One classroom, one iPad, many stories. *The Reading Teacher, 71*(6), 681-689. https://doi-org.ezproxy.liberty.edu/10.1002/trtr.1651

Forkosh-Baruch, A., Phillips, M., & Smits, A. (2021). Reconsidering teachers' pedagogical

reasoning and decision making for technology integration as an agenda for policy, practice and research. *Educational Technology Research and Development, 69*(1), 2209-2224. https://doi.org/10.1007/s11423-021-09966-7

Furman, M., De Angelis, S., Dominguez Prost, E., & Taylor, I. (2019). Tablets as an educational tool for enhancing pre-school science. *International Journal of Early Years Education, 27*(1), 6–19. https://doi.org/10.1080/09669760.2018.1439368

Gallup Poll. (2022). K-12 Workers have highest burnout rate in U.S. *Education News*. https://news.gallup.com/poll/393500/workers-highest-burnout-rate.aspx

Garavaglia, A., Garzia, V., & Petti, L. (2012). Quality of the learning environment in digital classrooms: An Italian case study. *Procedia Social and Behavioral Sciences*, *46*(1), 1735-1739. https://doi.org/10.1016/j.sbspro.2012.05.369

Gares, S., Kariuki, J., & Rempel, B. (2020). Community matters: Student-instructor relationships foster student motivation and engagement. *Journal of Chemical Education*, *97*(9), 3332-3335. https://doi.org/10.1021/acs.jchemed.0c00635

Gradient Learning Poll. (2023). Student engagement. https://gradientlearning.go-vip.net/gradientlearningwebsite/wp-content/uploads/sites/2/2023/01/GradientLearningPoll_StudentEngagement.pdf

Greener, S. (2018). Student disengagement: Is technology the problem or the solution? *Interactive Learning Environments*, *26*(6), 716-717. https://doi-org.ezproxy.liberty.edu/10.1080/10494820.2018.1498235

Guerrero, S., Walker, N., & Dugdale, S. (2004). Technology in support of middle grade mathematics: What have we learned? *Association for the Advancement of Computing in Education*, *23*(1). https://www.learntechlib.org/primary/p/12870/

Hazen, T. (2023). Smart board cost. *Tutors.com*. https://tutors.com/costs/smart-board-cost#:~:text=A%20smart%20board%20costs%20%242%2C000,safety%20features%20for%20classroom%20use.

Herodotou, C. (2017). Young children and tablets: A systematic review of effects on learning and development. *Journal of Computer Assisted Learning, 34*, 1-9. https://doi-org.ezproxy.liberty.edu/10.1111/jcal.12220

Hodge, B., Wright, B., & Bennett, P. (2018). The role of grit in determining engagement and academic outcomes for university students. *Research in Higher Education, 59*(4), 448-460. https://doi-org.ezproxy.liberty.edu/10.1007/s11162-017-9474-y

Hodges, T. (2018). School engagement is more than just talk. *Gallup Student Poll: Education.*

Höijer, B. (2008). Ontological assumptions and generalizations in qualitative (audience) research. *European Journal of Communication, 23*(3), 275-294. https://doi-org.ezproxy.liberty.edu/10.1177/0267323108092536

Horowitz-Kraus, T., & Hutton, J. (2018). Brain connectivity in children is increased by the time they spend reading books and decreased by the length of exposure to screen-based media. *Acta Paediatrica, 107*(4), 685-693. https://doi.org/10.1111/apa.14176

IGI Global. (2022). What is technology? https://www.igi-global.com/dictionary/business-models-for-digital-economy/29481

Ioannou, M., & Ioannou, A. (2020). Technology-enhanced embodied learning: Designing and evaluating a new classroom experience. *Educational Technology & Society, 23*(3), 81-94. http://ezproxy.liberty.edu/login?url=https://www.jstor.org/stable/26926428

Januariyansah, S., & Rohmantoro, D. (2018). The role of digital classroom facilities to accommodate learning process of the Z and Alpha Generations. *International Conference on Child-Friendly Education*.

Jennings, A., Jennings, A. B., & Farley-Ripple, E. (2020). Tools of the trade: A look at educators' use of assessment systems. *School Effectiveness and School Improvement, 32*(1), 96-117. https://doi-org.ezproxy.liberty.edu/10.1080/09243453.2020.1777171

Jha, K. (2020). Understanding Generation Alpha.

Karlen, Y., Suter, F., Hirt, C., & Merki, K. (2019). The role of implicit theories in students' grit, achievement goals, intrinsic and extrinsic motivation, and achievement in the context of a long-term challenging task. *Learning and Individual Differences, 74*(1). https://doi.org/10.1016/j.lindif.2019.101757

Kirkorian, H. (2018). When and how do interactive digital media help children connect what they see on and off the screen? *Child Development Perspectives, 12*(3), 210-214. https://doi-org.ezproxy.liberty.edu/10.1111/cdep.12290

Klein, A. (2019). Data: Here's what educators think about personalized learning. *Education Week*. https://www.edweek.org/leadership/data-heres-what-educators-think-about-personalized-learning/2019/11

Kolb, A., & Kolb, D. (2009). The learning way: Meta-cognitive aspects of experiential learning. *Simulation & Gaming, 40*(3), 297-327. https://doi-org.ezproxy.liberty.edu/10.1177/1046878108325713

Kolb, D. (1984). *Experiential learning: Experience as the source of learning and development.* Prentice-Hall.

Koponen, T., Aro, T., Peura, P., Leskinen, M., Viholainen, H., & Aro, M. (2021). Benefits of integrating an explicit SE intervention with calculation strategy training for low-performing elementary students. *Frontiers in Psychology*, *12*(1), 1-17. https://doi.org/10.3389/fpsyg.2021.714379

Kross, J., & Giust, A. (2019). Elements of research questions in relation to qualitative inquiry. *The Qualitative Report*, *24*(1), 24-30. https://nsuworks.nova.edu/tqr/vol24/iss1/2

Kurdi, V., & Archambault, I. (2020). Self-perceptions and engagement in low-socioeconomic elementary school students: The moderating effects of immigration status and anxiety. *School Mental Health*, *12*(2), 400-416. https://doi-org.ezproxy.liberty.edu/10.1007/s12310-020-09360-3

Layland, E., Stone, G., Mueller, T., & Hodge, C. (2018). Injustice in mobile leisure: A conceptual exploration of Pokémon Go. *Leisure Sciences*, *40*(4), 288-306. https://doi-org.ezproxy.liberty.edu/10.1080/01490400.2018.1426064

Learning A-Z. (2024). Motivating students with new customizable student avatars. https://www.learninga-z.com/site/resources/breakroom-blog/kidsaz-customizable-student-avatars

LearnPlatform. (2022). Edtech top 40. Fall 2022 report. *Instructure, North America.* https://www.instructure.com/resources/research-reports/edtech-top-40-fall-2022-report?filled

Lehane, L. (2020). Experiential learning—David A. Kolb. *Science Education in Theory and practice, (September).* https://doi.org/10.1007/978-3-030-43620-9_17

Li, Q. (2007). Student and teacher views about technology: A tale of two cities? *Journal of Research on Technology in Education, 39*(4), 377-397. https://files.eric.ed.gov/fulltext/EJ768884.pdf

Liu, C., Chen, Y., & Tai, D. (2017). A social network analysis on elementary student engagement in the networked creation community. *Computers and Education, 115*(12), 114-125. https://doi.org/10.1016/j.compedu.2017.08.002

Leszczynski, M., Metelski, A., & Rabczun, A. (2022). Digitalized sports products and various generations in the era of industry 4.0. *Sustainability*, *14*(1), 95. https://doi.org/10.3390/su14010095

Loibl, K., & Leuders, T. (2019). How to make failures productive: Fostering learning from errors through elaboration prompts. *Learning and Instruction, 62*(1), 1-10. https://doi.org/10.1016/j.learninstruc.2019.03.002

McCarthy, C., Lambert, R., Lineback, S., Fitchett, P., & Baddouh, P. (2016). Assessing teacher appraisals and stress in the classroom: Review of the classroom appraisal of resources and demands. *Educational Psychology Review, 28*(3), 577-603. https://www.jstor.org/stable/24761249

McCrindle, M., & Fell, A. (2020). Understanding Generation Alpha. *McCrindle Research Pty Ltd*. https://generationalpha.com/wp-content/uploads/2020/02/Understanding-Generation-Alpha-McCrindle.pdf

McDonald, S., Kehler, H., & Tough, S. (2018). Risk factors for delayed social-emotional development and behavior problems at age two: Results from the All Our Babies/Families (AOB/F) cohort. *Health Science Reports, 1*(10), 1:e82. https://doi.org/10.1002/hsr2.82

McGrath, C., & Åkerfeldt, A. (2019). Educational technlology (EdTech): Unbounded opportunities or just another brick in the wall? In A. Larson & R. Teigland (Eds.), *Digital Transformation and Public Services*: New York.

Mackenzie, S., Gabites, B., Briggs, A., McIntosh, J., Shelley, J., & Verstappen, P. (2017). Teacher leadership report: How student-led pedagogy in modern learning environments (MLEs) can improve literacy learning. *Journal of Educational Leadership, Policy and Practice, 37*(1), 62-69. https://doi.org/10.21307/jelpp-2017-006

Madigan, D., & Curran, T. (2021). Does burnout affect academic achievement? A meta-analysis of over 100,000 students. *Educational Psychology Review, 33*(1), 387-405. https://doi.org/10.1007/s10648-020-09533-1

Magsamen-Conrad, K., & Dillon, J. (2020). Mobile technology adoption across the lifespan: A mixed methods investigation to clarify adoption stages, and the influence of diffusion attributes. *Computers in Human Behavior*, *15*(1). https://doi.org/10.1016/j.chb.2020.106456

Marshall, C., & Rossman, G. (2015). *Designing qualitative research* (6th ed.). Sage Publications.

Martin, J. (2017). Carl Rogers' and B.F. Skinner's approaches to personal and societal improvement: A study in the psychological humanities. *Journal of Theoretical and Philosophical Psychology, 37*(4), 214-229. https://doi.org/10.1037/teo0000072

Martinez, M., & McGrath, D. (2014). Technology alone won't transform teacher to facilitator: Technology holds part of the answer to improving, but it must be combined with sharp and thoughtful changes in how teachers design curriculum and how students learn. *Phi Delta Kappan, 96*(1), 41-43. http://pdk.sagepub.com.ezproxy.liberty.edu/

Means, B., Padilla, C., DeBarger, A., & Bakia, M. (2009). Implementing data-informed decision making in schools: Teacher access, supports and use. *U.S. Department of Education, Office of Planning, Evaluation and Policy Development.* 1-110. https://eric.ed.gov/?id=ED504191

Mills, A., Durepos, G., & Wiebe, E. (2010). *Encyclopedia of Case Study Research*. Sage Publications.

Muenks, K., Yang, J., & Wigfield, A. (2018). Associations between grit, motivation, and achievement in high school students. *Motivation Science, 4*(2), 158-176. https://doi.org/10.1037/mot0000076

Mulyani, M., Razzaq, A., Ridho, Z., & Anshari, M. (2019). Smartphone and mobile learning to support experiential learning. *International Conference on Electrical Engineering and Computer Science (ICECOS),* 6-9. DOI: 10.1109/ICECOS47637.2019.8984501

My Tech High. (2022). *Student-tailored education program.* https://techtrepacademy.com/

National Assessment of Educational Progress. (2023). Student performance across subjects. *The Nation's Report Card.* https://www.nationsreportcard.gov/

National Center for Education Statistics. (2020). Characteristics of public and private elementary and secondary school teachers in the United States: Results from the 2017-2018 national teacher and principal survey first look. *NCES 2020: First Look ED*. https://nces.ed.gov/pubs2020/2020142rev.pdf

National Center for Education Statistics. (2023). School directory information, 2021-2022 school year. https://nces.ed.gov/ccd/schoolsearch/school_detail.asp?Search=1&InstName=Vanguard+Classical+School&Zip=80047&Miles=5&SchoolType=1&SchoolType=2&SchoolType=

3&SchoolType=4&SpecificSchlTypes=all&IncGrade=-1&LoGrade=-1&HiGrade=-1&ID=080234006611

Neumann, M. M. (2018). Parent scaffolding of young children's use of touch screen tablets. *Early Child Development and Care, 188*(12), 1654–1664. https://doi-org.ezproxy.liberty.edu/10.1080/03004430.2016.1278215

Neumann, M. (2018). Using tablets and apps to enhance emergent literacy skills in young children. *Early Childhood Research Quarterly, 42*(1), 239-246. https://doi.org/10.1016/j.ecresq.2017.10.006

Nicol, A., Owens, S., Eastwood, C., Coze, S., & MacIntyre, A. (2019). Comparison of high-technology active learning and low-technology learning classrooms. *Active Learning in Higher Education, 19*(3). https://doi.org/10.1177/1469787417731176

Payne, D. (2019). Ban the lecture: How young universities aiming for high rankings are preparing for "Generation Alpha". *Nature Index*.

Pearson. (2023). The power of student voices. https://www.pearson.com/en-us/higher-education/insights-and-events/teaching-and-learning-blog/2023/09/the-power-of-student-voices.html

Pew Research Center. (2021). Internet/broadband fact sheet. *Research Topics*. https://www.pewresearch.org/internet/fact-sheet/internet-broadband/

Purcell, K., Buchanan, J., & Friedrich, L. (2013). The impact of digital tools on student writing and how writing is taught in schools. *National Writing Project: The Pew Research Center's Internet & American Life Project.* http://fiscalresearchcenter.issuelab.org/resources/15514/15514.pdf

Plunkett, J. (2021). *Plunkett's education, edtech and MOOCs industry Almanac 2021: Education, edtech and MOOCs industry market research, statistics, trends, and leading companies.* Plunkett Research Limited.

Reeves, J., Gunter, G., & Lacey, C. (2017). Mobile learning in pre-kindergarten: Using student feedback to inform practice. *Educational Technology & Society*, *20*(1), 37-44).

Rivero, V. (2019). Study Island from Edmentum. *Edtech Digest.* https://www.edtechdigest.com/2019/08/02/studyisland/

Rogers, M. (2009). Baby Boomers and technology: An extended conversation. *AARP and Microsoft Focus Groups*.

Scalise, K., Irvin, P., Alresheed, F., Zvoch, K., Yim-Dockery, H., Park, S., Landis, B., Meng, P., Kleinfelder, B., Halladay, L., & Partsafas, A. (2018). Accommodations in digital interactive STEM assessment tasks: Current accommodations and promising practices for enhancing accessibility for students with disabilities. *Journal of Special Education Technology*, *34*(4), 219-236. https://doi-org.ezproxy.liberty.edu/10.1177/0162643418759340

Schacter, J., & Jo, B. (2016). Improving low-income preschoolers' mathematics achievement with Math Shelf, a preschool tablet computer curriculum. *Computers in Human Behavior, 55*(A), 223-229. https://doi.org/10.1016/j.chb.2015.09.013

Small, G., Lee, J., Kaufman, A., Jalil, J., Siddarth, P., Gaddipati, H., Moody, T., & Brookheimer, S. (2020). Brain health consequences of digital technology use. *Dialogues in Clinical Neuroscience, 22*(2), 179-187. https://doi.org/10.31887/DCNS.2020.22.2/gsmall

Subhash, S., & Cudney, E. (2018). Gamified learning in higher education: A systematic review of the literature. *Computers in Human Behavior, 87*, 192-206. https://doi.org/10.1016/j.chb.2018.05.028

Szymkowiak, A., Melovic, B., Dabic, M., Jeganathan, K., & Kundi, G. (2021). Information technology and Gen Z: The role of teachers, the internet, and technology in the education of young people. *Technology in Society, 65*(1). https://doi.org/10.1016/j.techsoc.2021.101565

Tang, X., Upadyaya, K., & Salmela-Aro, K. (2020a). School burnout and psychosocial problems among adolescents: Grit as a resilience factor. *A Journal of Adolescence, 86*(1), 77-89. https://doi-org.ezproxy.liberty.edu/10.1016/j.adolescence.2020.12.002

Tang, X., Wang, M., Guo, J., & Salmela-Aro, K. (2019). Building grit: The longitudinal pathways between mindset, commitment, grit, and academic outcomes. *Journal of Youth and Adolescence, 48*, 850-863. https://doi.org/10.1007/s10964-019-00998-0

Tang, X., Wang, M., Parada, F., & Salmela-Aro, K. (2020b). Putting the goal back into grit: Academic goal commitment, grit, and academic achievement. *Journal of Youth and Adolescence*. *50*(1), 470-484. https://doi.org/10.1007/s10964-020-01348-1

Technology Integration Matrix. (2023). Technology integration matrix. *Florida Center for Instructional Technology*: *University of South Florida.* https://fcit.usf.edu/matrix/matrix/

Terman, L., & Oden, M. (1947). *The gifted child grows up.* Stanford University Press.

Timotheou, S., Miliou, O., Dimitriadis, Y., Sobrino, S., Giannoutsou, N., Cachia, R., Mones, A., & Ioannou, A. (2022). Impacts of digital technologies on education and factors influencing schools' digital capacity and transformation: A literature review. *Education*

and Information Technologies, 28, 6695-6726. https://doi.org/10.1007/s10639-022-11431-8

Total Package Hockey. (2022). TPH Center for Excellence. https://tphcenterofexcellence.com/

Ulfa, S., & Fatawi, I. (2021). Predicting factors that influence students' learning outcomes using learning analytics in online learning environment. *International Journal of Emerging Technologies in Learning (Online), 16*(1), 4-17. https://doi.org/10.3991/ijet.v16i01.16325

Usher, E., Li, L., Butz, R., & Rojas, J. (2019). Perseverant grit and self-efficacy: Are both essential for children's academic success? *Journal of Educational Psychology, 111(*5), 877-902. https://doi.org/10.1037/edu0000324

Visual Academy. (2022). The history of online schooling. https://www.onlineschools.org/visual-academy/the-history-of-online-schooling/

Williams, K., & Clint, F. (2022). Learning environment: Types & characteristics. https://study.com/learn/lesson/learning-environment-types

Weninger, C. (2018). Problematizing the notion of 'authentic school learning': Insights from student perspectives on media/literacy education. *Research Papers in Education*, 33*(2), 239-254.* https://doi.org/10.1080/02671522.2017.1286683

Werd, P. (2020). Teaching the iGeneration: The secret assignment. *International Journal of Intelligence and Counterintelligence*, *34*(1), 134-150. https://doi-org.ezproxy.liberty.edu/10.1080/08850607.2020.1763735

Yin, R. K. (2009). *Case study research: Design and methods.* Sage Publications.

Appendix A
IRB Approval Letter

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

November 7, 2023

Crystal Rees
Jerry Woodbridge

Re: IRB Approval - IRB-FY22-23-1283 AN EXPLORATORY CASE STUDY OF STUDENT GRIT WITH EDUCATIONAL TECHNOLOGY IN LEARNING ENVIRONMENTS

Dear Crystal Rees, Jerry Woodbridge,

We are pleased to inform you that your study has been approved by the Liberty University Institutional Review Board (IRB). This approval is extended to you for one year from the following date: November 7, 2023. If you need to make changes to the methodology as it pertains to human subjects, you must submit a modification to the IRB. Modifications can be completed through your Cayuse IRB account.

Your study falls under the expedited review category (45 CFR 46.110), which is applicable to specific, minimal risk studies and minor changes to approved studies for the following reason(s):

7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies. (NOTE: Some research in this category may be exempt from the HHS regulations for the protection of human subjects. 45 CFR 46.101(b)(2) and (b)(3). This listing refers only to research that is not exempt.)

For a PDF of your approval letter, click on your study number in the My Studies card on your Cayuse dashboard. Next, click the Submissions bar beside the Study Details bar on the Study Details page. Finally, click Initial under Submission Type and choose the Letters tab toward the bottom of the Submission Details page. Your stamped consent form(s) and final versions of your study documents can be found on the same page under the Attachments tab. Your stamped consent form(s) should be copied and used to gain the consent of your research participants. If you plan to provide your consent information electronically, the contents of the attached consent document(s) should be made available without alteration.

Thank you for your cooperation with the IRB, and we wish you well with your research project.

Sincerely,

G. Michele Baker, PhD, CIP
Administrative Chair
Research Ethics Office

Appendix B

Duckworth 8-Item Grit Scale and Score

Survey/Questionnaire Questions

1. New ideas and projects sometimes distract me from previous ones. *

□ Very much like me

□ Mostly like me

□ Somewhat like me

□ Not much like me

□ Not like me at all

2. Setbacks don't discourage me.

□ Very much like me

□ Mostly like me

□ Somewhat like me

□ Not much like me

□ Not like me at all

3. I have been obsessed with a certain idea or project for a short time but later lost interest. *

□ Very much like me

□ Mostly like me

□ Somewhat like me

□ Not much like me

□ Not like me at all

4. I am a hard worker.

□ Very much like me

□ Mostly like me

□ Somewhat like me

□ Not much like me

□ Not like me at all

5. I often set a goal but later choose to pursue a different one. *

□ Very much like me

□ Mostly like me

□ Somewhat like me

□ Not much like me

□ Not like me at all

6. I have difficulty maintaining my focus on projects that take more than a few months to complete. *

□ Very much like me

□ Mostly like me

□ Somewhat like me

□ Not much like me

□ Not like me at all

7. I finish whatever I begin.

□ Very much like me

□ Mostly like me

□ Somewhat like me

□ Not much like me

□ Not like me at all

8. I am diligent.

□ Very much like me

□ Mostly like me

□ Somewhat like me

□ Not much like me

□ Not like me at all

8-Item Questionnaire Scoring:

For questions 2, 4, 7, and 8 assign the following points:

5 = Very much like me

4= Mostly like me

3= Somewhat like me

2= Not much like me

1= Not like me at all

For questions 1, 3, 5, and 6 assign the following points:

1= Very much like me

2= Mostly like me

3= Somewhat like me

4= Not much like me

5= Not like me at all

Add up all the points and divide by 8. The maximum score on this scale is 5 (extremely gritty), and the lowest score on this scale is 1 (not at all gritty).

Appendix C
Permission to Use Grit Scales

Research

My research focuses on two traits that predict achievement: grit and self-control. Grit is the tendency to sustain interest in and effort toward very long-term goals (Duckworth et al., 2007). Self-control is the voluntary regulation of impulses in the presence of momentarily gratifying temptations (Duckworth & Seligman, 2005; Duckworth & Steinberg, 2015). On average, individuals who are gritty are more self-controlled, but the correlation between these two traits is not perfect: Some individuals are paragons of grit but not self-control, and some exceptionally well-regulated individuals are not especially gritty (Duckworth & Gross, 2014).

Measures

Researchers and educators are welcome to use the scales I have developed for non-commercial purposes.

Appendix D
Permission to Use ISTE Matrix

Permissions & Licensing

Use the ISTE Standards for Free

Permitted educational use: Free

ISTE encourages free use of the ISTE Standards for noncommercial educational purposes under our permitted educational use agreement. This agreement grants you permission to download, link to, digitally publish and/or import the standards onto your intranet or other digital platform.

Permitted educational use includes using the ISTE Standards to:

- Guide learning and teaching.
- Help educators create lesson, curriculum and technology plans.
- Inform graduate and academic work (papers, portfolios, theses, dissertations, research projects, course materials, etc.).
- Frame job descriptions, requirements and goals.
- Import into your school, district or college digital platform using an XML file.

Appendix E
Individual Interview Questions

1. Guided tour question: What are some ways you use technology in your life?

   RQ1, SQ2

2. (Using three of the mentioned examples) Can you tell me some things you expect about technology when you say you use it [enter student example]?

   RQ1, SQ2

3. [Follow up]: of the ones you listed, what would you consider the most important and why?

   RQ1, SQ2

4. What are some ways you use technology for learning?

   SQ3

5. (Using three of the mentioned examples) Can you tell me some things you expect about [example of] technology when you're using it for learning either in class or for homework assignments?

   SQ3

6. [Follow up]: of the ones you listed, what would you consider the most important and why?

   SQ3

7. How do you think your teacher chooses assignments when they decide to use technology or not?

   RQ1

8. I'm going to show you a list of words. You can circle as many or as few as you'd like. The words you circle should represent things you think this technology does for you. If you're not sure how to read a word or what it means, I can help. SQ3
    a. Word choices: create, watch, research, collaborate, listen, read, write, adapt, practice, solve, remember,
9. How much do you agree or disagree with the following statement: SQ2, SQ3
    a. Technology is going to play an important role in solving many of the challenges the world faces today
    b. Technology is going to play an important role in solving many of the challenges the world faces tomorrow
10. Which of these statements comes closest to your opinion? SQ2, SQ3
    a. I most like technology to help me learn how to do things
    b. I most like technology to do things for me
    c. I most like technology to stay entertained
11. Tell me about a goal that you're working toward. How are you doing on that goal? SQ1, SQ2
12. How do you decide if or when you should stop working towards a goal? SQ1, SQ2
13. You took a previous survey on your grit, which was how hard you work towards something you're interested in. What makes you stay interested in something and work towards goals in general? SQ1, SQ2
14. What are some things that might make you feel like you'll have higher grit? SQ1, SQ2
15. What are some things that might make you feel like you'll have lower grit? SQ1, SQ2

16. What else would you like to add about technology as it relates to your learning that we haven't already talked about? RQ1

Appendix F
Observation Checklist

Device type	Laptop	Desktop	iPad/tablet	Other:
Use type	Web based	App based	Software	Other:
Subject	Math	ELA	Other:	

Navigation Observations	**Often**	**Somewhat**	**Not at all**	**N/A**	**Notes:**
Read/used instructional pages or directions					
Followed linear progression through learning objective					
Rapid clicked through edtech components					
Engaged in-product supports (help menu, information icons) for navigation					
Engaged supports for product navigation (asks researcher for help navigating)					
Usage modality: Mouse, touchscreen, one hand, two hand navigation,					
Academic/Instructional Observations	**Often**	**Somewhat**	**Not at all**	**N/A**	**Notes:**
Attentive to task/assignment					
Completed task					
Engaged in-product learning supports: *Circle as needed:* (vocabulary assistance, translation, text to speech, tutorials, examples, video explanations, graphics, narration/read aloud supports Other: _____					
Social Observations with Edtech	**Often**	**Somewhat**	**Not at all**	**N/A**	**Notes:**
On task					
Organized workspace					
Interacted appropriately with edtech					

Maintained eye contact with edtech					
Remained in allotted space *Circle as needed:* Standing Seated Constantly moving body Relatively stationary Knocked over seat Other: _____					
Showed enthusiasm/high interest					
Worked willingly and without frustration					

Non-Edtech Observation Checklist

Device type	Worksheet	Book	Other:	
Use type	Textbook related	Supplemental: teacher created	Supplemental: unknown	Other:
Subject	Math	ELA	Other:	

Navigation Observations	**Often**	**Somewhat**	**Not at all**	**N/A**	**Notes:**
Read/used instructional pages or directions					
Followed linear progression through learning objective					
Rapid progression through assignment components					
Engaged supports for assignment navigation (asks researcher for help navigating)					
Usage modality: Journal, digital, worksheet, or other (circle as needed) If other: _____					
Academic/Instructional Observations	**Often**	**Somewhat**	**Not at all**	**N/A**	**Notes:**
Attentive to task/assignment					

Completed task					
Engaged learning supports: *Circle as needed:* (vocabulary assistance, translation, text to speech, tutorials, examples, video explanations, graphics, narration/read aloud supports) Other: _ _____					
Social Observations with Edtech	**Often**	**Somewhat**	**Not at all**	**N/A**	**Notes:**
On task					
Organized workspace					
Interacted appropriately with assignment					
Maintained eye contact with assignment					
Remained in allotted space *Circle as needed:* Standing Seated Constantly moving body Relatively stationary Knocked over seat Other: _____					
Showed enthusiasm/high interest					
Worked willingly and without frustration					

Appendix G
Child Assent to Participate in a Research Study

What is the name of the study and who is doing the study?
The name of the study is "An exploratory case study of student grit with educational technology" and the person doing the study is Crystal Rees.

Why is Crystal Rees doing this study?
Crystal Rees wants to know what students in your age group expect from technology when it comes to learning and how you rate your grit. Grit has to do with how much effort you'll put towards something, even when it becomes difficult.

Why am I being asked to be in this study?
You are being asked to be in this study because you are enrolled in a grade between 3rd grade and 8th grade who uses technology for learning

If I decide to be in the study, what will happen and how long will it take?
If you decide to be in this study, you will be a part of three projects to help Crystal Rees learn about you:

- You'll check 8 statements on your own about grit and whether they sound like you or don't sound like you (10 minutes)
- You'll talk with Crystal Rees about expectations you have about technology (10-15 minutes)
- You'll use your classroom technology just like normal while Crystal Rees watches and takes some notes (20 minutes). Your real name will not be shared with anyone else.

This will take about an hour total for you, spread two weeks that work for the Crystal and you.

Do I have to be in this study?
No, you do not have to be in this study. If you want to be in this study, then tell Crystal, the researcher. If you don't want to, it's OK to say no. The researcher will not be angry. You can say yes now and change your mind later. It's up to you.

What if I have a question?
You can ask questions any time. You can ask now. You can ask later. You can talk to Crystal or you can ask your parents to talk to Crystal for you. If you do not understand something, please ask Crystal to explain it to you again.

Signing your name below means that you want to be in the study.

_____

Signature of Child/Witness Date

Crystal Rees

You can reach out for questions or to let her know you want to be in the study by email, text, or call:

[redacted]

Dr. Jerry Woodbridge

Liberty University Institutional Review Board
1971 University Blvd, Green Hall 2845, Lynchburg, VA 24515
irb@liberty.edu

Appendix K
Parental Consent

Title of the Project: An exploratory case study of student grit with educational technology in core classroom instruction
Principal Investigator: Crystal Rees, Vice President of Product Management, graduate student at Liberty University

Invitation to be Part of a Research Study

Your child is invited to participate in a research study. Participants must be in grade 3-9 and use technology within their typical learning environment. Taking part in this research project is voluntary.

Please take time to read this entire form and ask questions before deciding whether to allow your child to take part in this research project.

What is the study about and why are we doing it?

The purpose of the study is research is to understand the expectations 3rd-9th grade Gen Alpha learners have on educational technology (edtech) in learning assignments and how those learners rate their grit.

What will participants be asked to do in this study?

If you agree to allow your [child/student] be in this study, I will ask [him/her/him or her] to do the following things:

1. 8 Question Survey: 10 minutes
    a. Your child will answer an 8-question survey about grit. Grit is about how much effort someone is willing to put towards a goal, even when it may become difficult.
2. Interview: 10-15 minutes
    a. Your child will talk with the researcher about expectations they might have about edtech and answer a few more questions about grit
3. Observations while completing homework assignments as normal at home: 20 minutes
    a. Participating in person: your child would complete their homework, just like normal using edtech or not while the researcher watches and takes notes.
    b. Participating remotely: parents would complete a pre-check visit with the researcher to determine the best remote setup to observe the child during their homework assignments, just like normal, using edtech or not while the researcher watches via zoom and takes notes.

A pseudonym would be used to respect the privacy of your child and their parents.

How could participants or others benefit from this study?

A direct benefit for your child includes classroom technology better suited for how they learn that might encourage higher grit.

Benefits to society include understanding more about what students in grades 3-9 expect from technology in the classroom and how these students rate their grit. This could mean

better training for educators in choosing meaningful technology for their classrooms and better designed technology that meets students' expectations so that student learning is more relevant and applicable beyond the classroom.

What risks might participants experience from being in this study?

The risks involved in this study are minimal, which means they are equal to the risks your child would encounter in everyday life.

How will personal information be protected?

The records of this study will be kept private. Pseudonyms will be used for all students, teachers, and school names. Research records will be stored securely, and only the researcher will have access to the records.

- Participant responses will be kept confidential using pseudonyms. Interviews will be conducted in a location where others will not easily overhear the conversation.
- Data will be stored on a password-locked computer for three years upon completion of the study. Some direct quotes may be shared across themes of all participants. No identifiable information will be used.
- Interviews will be recorded and transcribed. Recordings will be stored on a password locked computer for three years and then erased. Only the researcher will have access to these recordings.

What conflicts of interest exist in this study?

The researcher has no financial interest in the outcome of this study. The researcher is a former elementary teacher and key product designer for edtech products.

This disclosure is made so that you can decide if this relationship will affect your willingness to allow your child to participate in this study. No action will be taken against an individual based on his or her decision to allow his or her child to participate in this study.

Is study participation voluntary?

Participation in this study is voluntary. Your decision whether or not to allow your child to participate will not affect current or future relations with Liberty University. If you decide to allow your child to participate, your child is free to not answer any question or withdraw at any time

What should be done if a participant wishes to withdraw from the study?

If you choose to withdraw your child from the study or your child chooses to withdraw, please contact the researcher at the email address/phone number included in the next paragraph. Should you choose to withdraw your child or should your child choose to withdraw, data collected from your child will be destroyed immediately and will not be included in this study.

Whom do you contact if you have questions or concerns about the study?

The researcher conducting this study is Crystal Rees. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at [redacted] by text or calling or by email at [redacted]. You may also contact the researcher's faculty sponsor, Dr. Jerry Woodbridge at [redacted].

Whom do you contact if you have questions about rights as a research participant?

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd., Green Hall Ste. 2845, Lynchburg, VA 24515 or email at irb@liberty.edu.

Disclaimer: The Institutional Review Board (IRB) is tasked with ensuring that human subjects research will be conducted in an ethical manner as defined and required by federal regulations. The topics covered and viewpoints expressed or alluded to by student and faculty researchers are those of the researchers and do not necessarily reflect the official policies or positions of Liberty University

Your Consent

Parental Consent: By signing this document, you are agreeing to allow your child to be in this study. Make sure you understand what the study is about before you sign. You will be given a copy of this document for your records. The researcher will keep a copy with the study records. If you have any questions about the study after you sign this document, you can contact the study team using the information provided above.

I have read and understood the above information. I have asked questions and have received answers. I consent to allow my child to participate in the study.

☐ The researcher has my permission to [audio-record /photograph] my child as part of his/her participation in this study.

_____

Printed Child's/Student's Name

_____

Parent's Signature Date

_____

Minor's Signature Date

Appendix I
Recruitment Flyer