The Pennsylvania State University

The Graduate School

College of Communications

CONNECTED LEARNING: EXPLORING CHILDREN'S MOTIVATIONS FOR NEW MEDIA USE, TECHNOLOGY IDENTITY AND ACADEMIC OUTCOMES

A Thesis in

Media Studies

by

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Submitted in Partial Fulfillment
of the Requirements
for the Degree of

Master of Arts

May 2014

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ABSTRACT

The rapid development of new media technologies has realized widespread adoption, especially among young users. Children and teens are particularly fond of media programs like games, apps, and social networking sites. This study explores the media use trends among 249 children and teens ages 10-17. The participant population is primarily made up of high school, African American students in Louisiana. These students were surveyed online to explore relationships between their media-use patterns, need fulfillment, enjoyment, power-usage levels and academic efficacy beliefs. This study objective is to quantify concepts identified in the 2008 Digital Youth Project and to develop an empirical measure for assessing youth media-use patterns. The proposed model is presented as a means for advancing the existing Connected Learning Theory. This study highlights one of three media usage patterns that facilitates the most enriching and enjoyable experience for young users. In addition, data indicate that certain patterns of use lead to need fulfilment, which in turn mediates the relationship between a child's level of use and their enjoyment of media. Finally, this study identifies several mediating variables and indirect paths that explain how youth media use in informal settings can predict their success in formal academic settings. All findings are discussed in light of practical design considerations and theoretical perspectives in the media effects literature.

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ACKNOWLEDGEMENTS

A debt of gratitude is owed Bobbye Johnson, Gregory Johnson, Deshonda Coleman, Monica McDaniels Michael Schmierbach, Mary Beth Oliver, Heather Zimmerman, Verricha Stewart, Ftr. Edward Chiffriller, St. Francis Xavier Catholic Church & School, Paula Fabre, Betty Bickham, Stacey Vessell, Stephanie Preston, Tanner Cooke, Alyssa Appelman, Cari Tindall, Brittany Brown, Leslie Woods, Lorraine Taylor, Arleen Peterson, Enica Castina, S. Shyam Sundar, Josalyn Coleman, Patrick Parsons and the Don Davis Center for Ethical Research. The success of this thesis would not have been possible without their diligent efforts, expertise, support and generosity.

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Chapter 1: Introduction

New media technologies have become increasingly popular each year, and have achieved widespread adoption as a central component in communication. Indeed, these technologies have found their way into the hands of children and teenagers for frequent use. New-media games, applications and social networks are trending among young users for daily consumption across multiple platforms and devices. These programs are accessed by young users in the home, classroom, social, and community spaces (Johnson et. al, 2013). Media use among children and teens increased with the growth and development of mobile devices like smartphones and tablets.

Parents fuel these usage patterns by placing new media technologies in the hands of children, often with an optimistic belief that it will aid learning. This optimism about new-media benefits are so strong that parents place these devices in their children's hands as young as infancy and continue to do so throughout their childhood and adolescent years (Chiong & Shuler, 2010). New media technologies develop at such a rapid rate that the research to evaluate their effectiveness lags behind. The spirited integration trend of new media technologies without supporting research reflects an unrealistic expectation that just as "fire radiates heat, mobile computers radiate learning," (Dede, 1995; as cited in Warshauer & Matuchniak, 2010).

In order to validate or disprove these "osmosis-learning" beliefs, media effects scholars and education researchers have placed children and new media on the priority research agenda. There indeed have been studies that support new media as a learning tool (Bransford, 2006; Enyon & Malmberg, 2011; Kukulska-Hulme et al., 2009; Pachler et. al, 2010; Sharples et.al, 2009). New-media use in informal settings is a particularly interesting area of focus, since a significant portion of learning happens in non-traditional or informal settings (Cross, 2007). In

order to understand the potential for new-media learning, there are several important questions to ask. For example, do all children benefit equally from mobile use? Is there a prototype of user? Should all children use mobiles in the exact same way in order to reap learning benefits? How can designers make new media programs personally relevant for the child to foster excitement about learning?

Among those leading the efforts to answer these questions is Mimi Ito, who introduced the theory of "Connected Learning." The Connected Learning Theory (CLT) focuses on the use of new media devices and programs for molding young users into activated and well-supported learners. The Connected Learning Theory posits that in order for new media devices to facilitate learning, they must be socially embedded, interest-driven, and oriented toward educational, economic, or political opportunities to magnify learning opportunities (Ito et. al, 2013). Successful implementation of CLT practices has the potential to build useful skill sets that aren't taught in traditional classroom settings. This theory places the child/teen user at the core of new media use by focusing on their particular interest levels and motivations for use. The Connected Learning Theory and Digital Youth Project proposes a typology system of "interest-driven" and "friendship-driven" uses. These terms describe children's motivations that may determine mobile use frequencies, patterns, and gratifications across three stages of "hanging out" "messing around" or "geeking out" (Ito, 2010a).

This idea of individual differences as a determining factor of new media learning outcomes deviates from the "osmosis-learning" belief trend mentioned above. Thus, the CLT is a step in the right direction for evaluating new media learning effects. Much of the Connected Learning research is theoretical and qualitative (Ito 2008, 2009, 2010) A vital missing component to this theory are empirical measures to determine a child's stage, motivations, and

gratifications of media use. This study seeks to bridge the research gap and advance the Connected Learning Theory by proposing empirical measurements from an existing individual need-fulfillment theory that parallels the CLT motivations and levels of media use.

This study, while interested in developing a measurement for evaluating motivations associated with media use patterns, has several additional objectives. This study also seeks to explore the ways in which different motivations and levels of use relate to young user's levels of enjoyment, technology efficacy beliefs and academic beliefs/performance. Previous research suggests that the very motivations that fuel a child's desire for learning in informal settings may reflect their motivations for learning in formal, classroom settings (Bransford, 2006; Enyon & Malmberg, 2011).

In particular, this research will labor to answer questions of whether child/teen motivations for new-media technology use parallel their motivations for academic success in the classroom. This study will also seek to contribute theoretical and design implications for new-media programs by providing a deeper understanding of how new-media-use patterns and motivations relate to formal learning motivations. A product of this study will be a set of design principles that support personalized need fulfillment through new-media devices while identifying relationships between a child's beliefs in their ability to master technology and their ability to succeed academically.

Chapter 2: Literature Review

Connected Learning Theory and Youth New Media Practices

The Connected Learning theory (CLT) is at the core of the Connected Learning Research Network, which employs a new-media research agenda to broaden access to learning that is socially-embedded, interest-driven, and oriented toward educational, economic, or political opportunity (Ito, 2013). The CLT uses the word connection to connote not only the connection that young new media users have to their mobile computing devices, but also the connections with peers and adults who support the effective use of these devices to encourage learning across contexts. "Connected learning is realized when a young person is able to pursue a personal interest or passion with the support of friends and caring adults, and is in turn able to link this learning to and interest to academic achievement, career success, or civic engagement," (Ito, 2012, p. 4). The Connected Learning Research Network works to bridge the gap between in-school learning and out-of school learning by promoting the use of digital media to link home, school, community, and peer contexts of learning based on shared interests, (Ito, 2013).

The guiding principle of the CLT is the idea that effective learning from new media is realized when a young person explores content that he/she has a personal interest or passion in, with the support of friends or adults. CLT purports that interest driven, self-directed, and open-ended learning and inquiry explorations encourage specialization or expertise around subject matter (Ito, 2013). A significant portion of this personal relevance is rooted in culture and may not be discussed in the formal classroom environment, especially if the child belongs to a minority or has a sub-group identity. So often, parents and educators regard the personal and recreational use of new media by children as a silly waste of time. However, the CLT posits it is through these personally meaningful uses of new media that children acquire skills related to

peer-learning, education, literacy, and public participation (Ito, 2010). This study is an extension of that sentiment and seeks to explore how young people's everyday out-of-school new media identities and participation serve as a potential avenue for understanding their in-school identities and participation.

Bridging the Gap with Technological Identities

The Connected Learning Theory highlights a widening gap between children's everyday life worlds outside of school and the current structures of educational systems. Young people's use of new media is tied to a digital divide between in-school use and out-of-school use (Buckingham, 2007). This study seeks to challenge that assumption by proposing connections between a child's technological identity and their academic identities. To begin, it is necessary to understand the technology identities that youth develop. The Digital Youth Project (DYP) was a national, three-year qualitative study dedicated to this very purpose of understanding levels of media participation and developing a range of technology identities among American youth. Beginning in 2005 and spanning through 2008, a breadth of ethnographic studies with 23 case studies was conducted, involving dozens of researchers sampling a wide range of different youth, primarily middle and high school students in the Silicon Valley area of California, to identify a common thread among levels of media use, participation, and identities (Ito, 2010). This research approach sought to meet youth at the place of their personally relevant media use and connecting these uses with broader social and cultural concepts to determine the future of learning and education in the digital age.

Among the data that emerged from the DYP was a typology system that highlights the important categories and structures that determine new-media practices and learning outcomes (Ito, 2010a). The DYP data suggests that youth develop technology identities that correspond to

their frequency and sophistication levels of media use. The nomenclature for these range of identities are labeled as "hanging out," "messing around," and "geeking out" (Ito, 2010a).

The term "hanging out" describes young people's use of mobile media devices to "communicate and construct spaces for co-presence where they can engage in on-going, light weight social contact that moves fluidly between online and offline contact," (Ito, 2010a, p.42). Some of the patterns associated with "hanging out" forms of media usage include participating in social networking sites, utilizing instant message programs, sending text messages, watching videos on YouTube, listening to music, playing games with friends, downloading and sharing files among their friends and posting songs to their personal social networks/websites/blogs.

These activities for "hanging out" media-use patterns are on the lighter and less intense end of new-media use. Most of the "hanging out" practices are done with the intention of enhancing social interactions with friends during off-line socializing. In addition, "hanging out" practices are done with the intention of creating on-line experiences to mirror off-line interactions. The common patterns among users who turn to new media technologies for "hanging out" purposes are a tendency to engage in content consumption for social purposes or in social settings.

This technology identity correlates with those who use media for the function of "getting together" and "being together" (Ito, 2010a). Youth are turning to new media as a way to mobilize and keep ongoing contact with peers. The DYP found that social networking sites were a major means of mobilization for maintaining contact because they offer avenues for virtual co-presence (Ito, 2010a). A means of keeping tabs was often social networking sites, instant messaging programs, phone conversations and emails. Another finding associated with youth who have a

dominant “hanging out” technological identity was listening to music with friends. This pattern emerged as one of the most common ways that youth hang out together (Ito, 2010a).

The next media use level and technology identity is “messing around,” which refers to friendship-driven practices that encourage engagement with new media that is fueled in part by the desire to maintain connections with friends and represents participation patterns along with more sophisticated use and engagement with new media (Ito, 2010a). Young people can act out messing-around patterns based on a range of desires like the desire to establish or maintain connections with others, the desire to learn about new media or a specific subtopic within the new media (Ito, 2010a). “Messing-around” patterns of new media use include using search engines to find online information and sources, or engaging in trial-and-error manipulation of content or search inquiries to learning about how particular mediums work. This use of search engines includes the practice of “fortuitous searching,” which describes searching that is goal-directed and open-ended. The DYP found that youth at the “messing around” level of participation were conducting searches that involve seeking information that is personally relevant and to satisfy their own curiosity by moving from link-to-link and open-ended searches. These searches ranged from finding information to complete homework assignments, looking for cheat codes for games, or completing a particular task (Ito, 2010a).

The difference between “hanging out” and “messing around” patterns is that in the latter, users engage in more information-seeking practices, rather than simply content consumption. The DYP describes an example of progressing from the “hanging out” level of media participation to the “messing around” level. For instance, a youth who only uses new media to listen to music is at the “hanging out” level. However, if she then develops a stronger interest in the music and conducts a search about the artist, looks up the lyrics, and burns a copy of the song

for friends, she is in the "messing around" stage (Ito, 2010a). The development of a youth's interest in a particular topic can fuel the desire to make more sophisticated use of new media resources.

The third and final media level use is "geeking out," which refers to an intense commitment or engagement with new media technologies. This type of media-use pattern usually centers on one particular media property, genre, or type of technology (Ito, 2010a). This category of technology identity and media use includes young users who are involved in media fandom, like committed gamers. The everyday practices of those who are in the "geeking out" stage include sophisticated and frequent use of new media and high levels of specialized knowledge about their program of choice (Ito, 2010a). Any use of technology in an intense, autonomous and interest-driven way describes this highest level of media-use pattern as identified by the DYP. Examples of media-use patterns among users who are in the "geeking out" stage are those who customize their media environments. A "geeking out" user, for example is a person who creates and personalizes their Google homepage, RSS feed, or blog site to reflect their topics of interests. This dedication to pursuing a particular interest builds an expertise knowledge base, which in turn earns the individual "geek cred" (Ito, 2010a).

The media-use practices associated with those who are in the "geeking-out" stage also correlate to the development of a particular interest and the need to fulfill that interest as compared with those who are in the "messing around" stage. The DYP explicates "geeking out" media participants as those whose interest has advanced to the fandom stage. An example would be a gamer whose use begins as a way of "hanging out" with friends, to seeking cheat codes at the "messing around" stage and finally to reaching "geeking out" status by acquiring high levels of specialized expertise, following a fellow gamer's blog and composing entries, finding illegal

downloads and information on ways to cheat the gaming system, and rising to leadership and fame among peers, which may come with the perk of getting paid to share expertise information (Ito, 2010a). These intense levels of engagement mark the highest level of media participation found in the DYP.

The types of media participation and technology identities as outlined by the DYP do not restrict young users to one particular stage, nor does this work suggest that every child will advance through each stage. A child's pattern of media use can fall anywhere on the spectrum from "hanging out," "messing around" or "geeking out" (Ito, 2010a). However, understanding which type of participation motivates a child's use of digital media and their stage of use is imperative for advancing the goals of Connected Learning Theory and exploring relationships between technological identities and academic identities.

Much of the CLT research network work is ethnographic observations, case studies, interviews and other forms of qualitative research (Ito, 2009, 2010a, 2010b). The Digital Youth Project in particular is a major stride in identifying the various levels of use among youth in America by asking fundamental questions and highlighting relevant factors in new media adoption trends. However, the ethnographic observations in this project do not lend themselves to testing analytic categories or targeted hypotheses. These qualitative forms of data are indeed valuable; however, a parsimonious measurement also has potential to advance theory with the predictive power of reliable scales. Developing a quantitative measure for identifying a child's motivation for digital media use is an important step for advancing the CLT. This paper will propose a quantitative measure that captures Ito (2010) concepts of friendship-driven and interest-driven patterns of media use with the Self Determination Theory.

RQ1: Can the new media use patterns outlined in the Digital Youth Project data be used to develop reliable, quantitative scales for measuring technological identity?

Self Determination Theory

To further understand young users' technology identities, it is important to explore the role that motivation may play in fueling these interest-driven patterns of media use. In order to quantitatively analyze "hanging out," "messing around," and "geeking out" media use patterns, it will be advantageous to examine them through the lens of an established empirical media effects scale. The Connected Learning Theory purports that the most meaningful uses of new media technologies are those that are personally relevant and interest-driven (Ito, 2013). If this concept holds true then children who develop certain patterns of media use should experience varying degrees of need fulfilment, which will motivate them to continue these media use patterns. These ideas of need fulfilment and intrinsic motivation for use can all be empirically outlined with the Self Determination Theory.

The Self Determination Theory (SDT) is a theory of motivations that uses empirical methods to understand human motivations and personality traits based on inner resources for personality development and behavioral self-regulation (Ryan, Khul, & Deci, 1997). SDT is rooted in the understanding that humans are inclined to fulfill three natural psychological needs of competence, autonomy and relatedness for optimal psychological well-being. These said needs are innate and the degree of need for fulfillment can vary based on personality and individual differences.

This theory is particularly valuable for empirical researchers because it "allows for prediction of the social conditions that promote high-quality development and performance," (Deci & Ryan, 2000, p. 262). This predictability is essential in advancing the understanding of

youth technology identities through engagement with new media programs that they find interesting and personally relevant. This study proposes that youth media use patterns correspond to certain levels of need fulfillment, which then motivate continued use patterns that correspond to their technological identity.

SDT lays a clear framework for considering the psychological needs of competence, autonomy, and relatedness as a means of predicting how the pursuit and attainment of goals will be associated with positive or negative performance and well-being outcomes (Deci & Ryan, 2000). New-media technologies have the potential to serve as empowerment tools for autonomy, competence and relatedness need fulfillment. The intrinsic motivation to fulfill psychological needs of competence, autonomy, and relatedness could plausibly inform why youth participate in "interest-driven" media-use patterns with varying degrees of sophistication.

Autonomy is the sense of choice or control, competence is the level of perceived self-belief in the ability to complete a task or solve a problem, and relatedness is the sense of shared experience or community (Gagne & Deci, 2005). Autonomy refers to the innate desire to self-organize behaviors and experiences in line with a sense of self and freedom (Deci & Ryan, 2000). This concept of freedom and independence in organizing experiences according to self-awareness is at the core of healthy human functioning. The ability to independently complete a task with many choices and little external controls would be an example of fulfilling the psychological need of autonomy.

The next intrinsic need for psychological well-being is competence. Fulfilling the intrinsic need for competence can happen as a result of positive feedback and individuals feeling responsible for competent, autonomous performance (Deci & Ryan, 2000). Feelings of competence will satisfy intrinsic needs as long as that competence is in conjunction with feelings

of autonomy. Competence is increased via unexpected positive feedback on a task or activity. This then increases the intrinsic motivation to continue with the task or perform it again.

Finally, relatedness refers to the sense of security from others in the form of relational support (Deci & Ryan, 2000). Relatedness needs are fulfilled in tasks or activities that allow for the building of meaningful relationships. An example would be interactions that increase feelings of attachment, inclusion, understanding, and happiness. Experiencing these feelings increases the intrinsic motivation to continue to partake in the activity. Each of these needs — autonomy, competence, and relatedness — will be considered for measuring need satisfaction that youth experience through their media consumption patterns.

Self Determination Theory and Media Use Motivations

Several media effects research studies have used the predictive power of the SDT to examine and understand media users' personality traits, intrinsic motivations for psychological need fulfillment, and the subsequent effects on media consumption patterns. The study of motivations for users to consume new-media programs like applications and/or social networking sites is nascent. However, a wealth of information exists on video games and computer game play motivations (Johnson & Gardner, 2010; Peng et. al, 2012; Przybylski et. al, 2012; Ryan, Rigby & Przybylski, 2006; Rigby, 2004; Rigby & Ryan, 2006; Sorebo & Haehre, 2012; Tamborini, 2010; Yee, 2005). Existing research in game-play motivations uses the Player Experience of Need Satisfaction (PENS) scale to measure need satisfaction based on the SDT. This scale enables the empirical measurement of examining the role that perceptions of autonomy, competence and relatedness play in enhancing motivation to play (Ryan, Rigby & Przybylski, 2006). In a study exploring player motivations for computer game play in a laboratory setting, players who experienced competence and autonomy need fulfilment during

game play were significantly more likely to engage in free choice continued play of the game, express enjoyment, and score higher on self-esteem measures (Ryan, Rigby & Przybylski, 2006).

In addition, Peng and colleagues (2012) found that satisfaction of autonomy and competence needs were significant predictors of motivation and engagement outcomes. Need satisfaction of autonomy and competence mediated the relationship between game features and motivational pull that players experienced (Peng et al., 2012). The Digital Youth Project and Connected Learning Theory suggest that varying personality traits and interest-driven preferences influence the varying technology identities. Johnson and Gardner (2010) took a similar approach to understand how personality traits influence motivation for game play. Unlike the aforementioned studies that manipulated competence, autonomy, and relatedness features in the game, this study had participants recall their perceived need fulfillment using questions from the PENS scale. The results from this study also indicate significant relationships between game genre preference/motivation and personality and need satisfaction (Johnson & Gardner, 2010). Considering the existing research that connects specific media use patterns with feelings of need satisfaction, this study proposes the following research question.

RQ2: What is the relationship between a youth's technology identity and their perceived need fulfillment from new media use?

Motivations, Media Use Patterns, and Enjoyment

For decades, the practice of defining enjoyment as need satisfaction has been a common practice across a several of inter-disciplinary fields (for example Zillman &Bryant, 1985; Zillman & Cantor, 1976; Katz, Blumler, & Gurevitch, 1974). In reference to media effects research, enjoyment has been long understood as need fulfilment by assessing pleasurable

responses to media content (Reiss & Wiltz, 2004; Oliver & Sanders, 2004; Grodal, 2000). Tamborini and colleagues (2010) applied the Self-Determination Theory motivation for satisfying intrinsic needs to understand player's enjoyment of game play. Fulfillment of autonomy, competence, and relatedness mediated the relationship between game play and enjoyment.

Enjoyment, as defined in this study, is the fulfilment of intrinsic motivations (Tamborini et. al, 2010). Ito (2010a) classifies "hanging out," "messing around," and "geeking out" media use patterns by level of engagement or time spent using digital technologies. Data from the Digital Youth Project connotes time spent and level of intensity of media activities as the meaning of engagement. Children advance through the "hanging out," "messing around" and "geeking out" stages by making increasingly frequent and sophisticated use of new media. Ostensibly, advancement through stages is an indication of heightened interest-levels and enjoyment of the activity. Considering the potential for need satisfaction to serve as a mediator of motivation and enjoyment, it is reasonable to propose the following research question.

RQ3: Will perceived need fulfilment mediate the relationship between technology identity and enjoyment?

Technology Identity and Technological Efficacy

The media-use data that emerged from the Digital Youth Project classified youth technology identities according to their interest-driven level of intense, sophisticated use of new media (Ito, 2010a). In order to expound upon this finding and create a holistic empirical measurement of technology identity, this study will measure perceived technology efficacy as only a starting point for accessing a youth's confidence in technology. Technological efficacy is an important measurement because existing research supports the parallel between youth's

perceived internet efficacy, technology skills, and confidence in their proficient use of the internet (Eynon & Malmberg, 2011). This study objective mirrors that of the Digital Youth Project in its endeavor to create a typology scale of how young people use the Internet. This quantitative study found several important links between youth internet use patterns and perceived internet efficacy levels. Less frequent internet users reported much higher internet efficacy beliefs than average internet users and infrequent internet users (Enyon & Malmberg, 2011).

Additional research confirms the importance of measuring young people's confidence in their ability to use new media because these self-reported skills can shed light on how and what youth are using the internet for. Cheong (2008) found in a study of young people in Singapore that perceived internet skills were positively related to the range of their online activities. As stated in the DYP, the range and level of sophistication in media activities is what determines a youth's technological identity on the scale of "hanging out," "messing around" or "geeking out." Both of the aforementioned studies had participants indicate their perceived internet skills by rating their skills on a scale of 1-10. Arguably, this measurement is flawed in its ability to effectively measure technology efficacy. A one-item measurement, such as this one, lacks internal consistency and data may confound with youth's social desirability concerns.

Power Usage as a Measure of Technological Efficacy

In order to address the internal consistency issue associated with the one-item question that prompts respondents to rate their technology efficacy, this study proposes the use of a multiple-item scale constructed to indicate confidence in technology use. One such scale that should accurately reflect technology efficacy beliefs is the power usage scale. Power use describes technology users who are highly self-motivated to discover, learn and experience

technology, often pushing devices to their functional limits (Sundar & Marathe, 2010). The power user index is a 39 item scale measurement that has been used to guide a wealth of media-effects research (for example, Marathe et al., 2007; McAlearney, Schweikhart, & Medow, 2004; Sundar & Marathe, 2010).

Typically, users have the tendency to take advantage of the only the bare minimum and default features of technology (Marathe et al., 2007). However, power users typically earn the title as "experts" with higher levels of self-efficacy with technology (Sundar & Marathe, 2010). Power use is explicated as an individual difference variable and has been found to moderate the effects of user's psychological outcomes with technology (Sundar & Marathe, 2010). Power usage is measured in degree of motivation, expertise, efficacy and behavior (Marathe et al., 2007). These four dimensions directly relate to the variables of motivation for use, efficacy, and media use patterns as proposed by this study. This study will attempt to substitute the crude technological efficacy measure with a more complex measure, power usage. Therefore, this study proposes the following hypotheses.

H1: Technological efficacy can be measured as power usage; these variables reflect the same theoretical concept and will be significantly and positively related.

Technology Efficacy and Academic Efficacy

The Connected Learning Theory is committed to understanding children's media use patterns as a means for making broader social and cultural connections. Much of the Connected Learning Theory is dedicated to understanding and enhancing the ways that young people's use of new media devices can enhance their learning in formal settings. A particular focus is placed on the way that new media transforms the way youth are empowered to negotiate in their educational environments (Ito et. al, 2013). Prior media effects and educational research

documents connections that informal use and learning with new media technologies have to formal learning (Pachler, Bachmair, & Cook, 2010; Sharples et. al, 2009; Wong, 2012).

In addition to the claims made by CLT to the learning effectiveness and connection between new media use and the subsequent implications for education, other research has supporting theses. Understanding young people's use of the Internet outside formal contexts enables practitioners, researchers and policy makers to better understand ways to enhance education and learning (Enyon & Malmberg, 2011). The interest-driven and autonomous search inquiries that youth engage in during the "messing around" stage of media use for something like finding answers to homework problems lead to information-acquisition-enhanced knowledge about that subject matter (Ito et al., 2013). As youth progress through the various stages of media use as outlined in the Digital Youth Project, their expertise with technology increases with the more sophisticated use of new media programs. This increased confidence in their ability to use technology may also increase their confidence in their ability to master academic content, thus influencing their academic efficacy beliefs.

Connecting Informal Media Use with Formal Academic Performance

The ultimate goal of this research study is to identify paths that connect youth media use patterns with academic performance. Several qualitative studies have been successful in documenting connection between new media learning and learning in formal settings (Jones, Scanlon & Clough, 2013; Kukulska-Hulme & Traxler, 2007; Pachler, 2007). New media devices, specifically mobile technologies, are ideal for supporting personalized, authentic informal learning because of the size, mobility, and affordances that allow information to be accessed based on the current context, (Kukulska-Hulme & Traxler, 2007). These new media devices allow for the user to have control over their consumption, and allow for the setting and

maintaining of their own goals within the technology. These devices also allow for the communication between other users, supporting information sharing and collaborative activities (Jones, Scanlon & Clough, 2013). These affordances echo concepts related to the intrinsic needs of competence, autonomy and relatedness.

New media devices have the capacity to satisfy intrinsic needs, which increases enjoyment, and the motivation for continued use. This study proposes that this continued use will increase user's confidence in their ability to use the technology or their level of power usage. As a power user, their confidence and competence in technology may contribute to their confidence and competence in the classroom. There is insufficient empirical evidence that informal uses of technology can lead to formal learning because of the difficulties associated with measuring informal learning (Pachler, 2007). Understanding the complexities associated with understanding informal learning with new media, this study proposes a set of indirect paths that explore the connections that media use may have with academic success. This study predicts that media use patterns, need fulfilment, enjoyment and efficacy beliefs will ultimately predict formal academic performance. Therefore this study will explore how all of the aforementioned variables work together by answering the following research question.

RQ4: What is the relationship between technological identity, need fulfillment, and technological efficacy/power usage?

RQ5: Is there an indirect relationship between media use patterns, need satisfaction, enjoyment, power usage, academic efficacy, and academic performance?

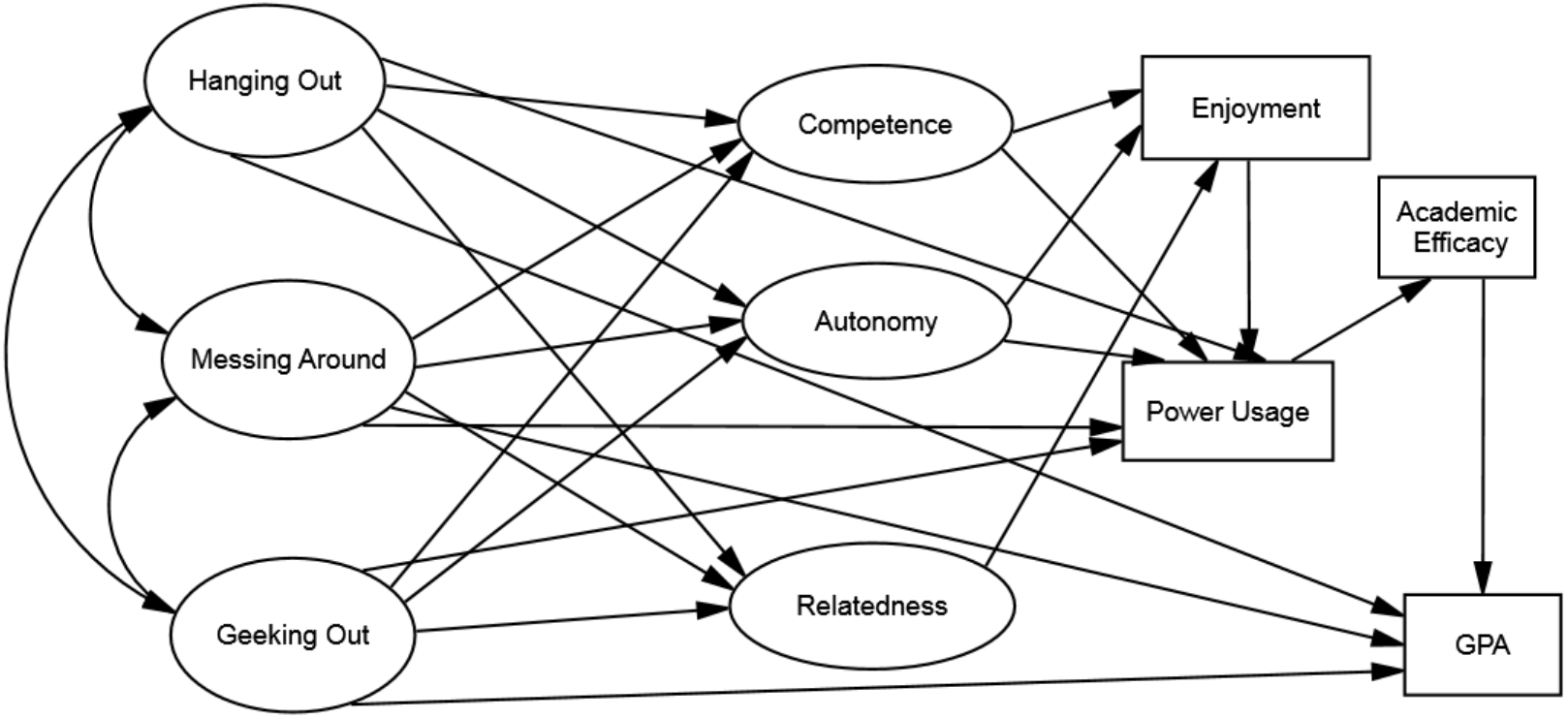


Fig. 1 Proposed Connected Learning Model. Summary of Research Questions and Hypotheses

Chapter 3: Methods

Sample

Two hundred eighty two children were recruited from elementary, middle, and high schools in central Louisiana and central Pennsylvania. A total of 30 participants were removed from sample due to incomplete survey responses. The final sample size for analysis was 249. The average age of participants was 14.42, ranging from 10-17. The total sample demographic was overwhelmingly African American (*n* = 205). The majority of participants were high school students, grades 9-12 (*n* =193). There were more female participants (*n* =140) than male participants (*n*=109). Parents and children were provided with an informed consent form and assent forms and required to sign in order to participate. Incentives to participate included the chance to enter a raffle for 50 gift cards, worth $5.

Procedure

This study was conducted during a 3-week period via an online survey using Qualtrics. All parents and children recruited for participation were contacted via email and directed to sign up through the website www.acjthesis.com. Once parents and children read and understood the study requirements and implications they indicated their consent and assent with an electronic signature. Once parental consent and child assent were received, participants were led to the survey. No identifiable data was collected during the course of this survey. The survey was comprised of approximately 30 questions and participants were required to spend a total of 20-30 minutes to complete all items. After completing the survey, participants were given the option to enter the raffle for a gift card by providing an email address. Participants were then debriefed and thanked for their participation.

Measures: Independent Variables

Technological Identity & Media Use Patterns. The independent variable of technology identity was formed based on the data obtained from the Digital Youth Project. The media use patterns data that emerged to form the technological identity categories of "hanging out" "messing around" and "geeking out" were used to build the following scales. To measure the least sophisticated level of media use, "hanging out" the participants were asked how often they use new media technologies to "send emails," "chatting online," "spending time on social media sites" or "posting comments or messages to a webpage." (M = 15.55, SD = 6.16, Cronbach's α = 0.62). Participants were asked to indicate how often they engage in these activities via a four item, 7-point Likert type scale, ranging from 1-never, to 7-often. All of these patterns of friendship-driven media uses correspond to the DYP data observation of kids using the media for "getting together and being together" (Ito, 2010a).

The next category, which incorporates a higher level of sophisticated use of new media based on interest-driven inquiries, is the "messing around" technological identity (Ito, 2010a). Participants were measured for this level of technology identity by indicating their use of new media for the purposes of "looking for information that interest you," "researching products you would like to buy or own," "reading or keeping up with the news," "buying products online," "watching TV/Netflix on demand from the computer," "watching videos on YouTube," "downloading or streaming music," and "playing online games/applications." (M = 33.86, SD = 9.84, Cronbach's α = 0.74). Participants were asked to indicate how often they engage in these activities via an eight item, 7-point Likert type scale, ranging from 1-never, to 7-often.

The final category that encompasses the most sophisticated use of new media is what the DYP labels "geeking out." In order assess "geeking out" levels of media use, participants were

asked how often they engage in activities like "using a mobile device for creative writing/blogging," "writing or composing music or lyrics," "creative drawing or improving/editing photos," "writing your own blog," "adding or changing content in a wiki or webpage," "putting podcasts, music, or videos on the Internet," and "reading a blog." (M = 17.59, SD = 9.24, Cronbach's α = 0.80). Participants were asked to indicate how often they engage in these activities via seven item, 7-point Likert type scale, ranging from 1-never, to 7-often.

Measures: Proposed Mediating Variables

Need Fulfillment. In order to measure assess whether or not need fulfillment motivated participants to use new media, items from the Player Experience of Need Satisfaction (PENS) scale were used to measure need satisfaction based on the Self Determination Theory variables. This scale enables the empirical measurement of examining the role of perceptions of autonomy, competence and relatedness in enhancing motivation to play (Ryan, Rigby & Przybylski, 2006). Each variable was measured using five item, 7-point Likert-type scales, ranging from 1-strongly disagree to 7-strongly agree. Participants were asked at the beginning of the survey to list their three favorite media activities or programs. For these SDT questions, one of their favorite activities was randomly piped into the question.

To measure competence, participants responded to statements like, "I think I am pretty good at (insert piped response)," or "I am satisfied with my performance in (insert piped response)," (M = 27.82, SD = 6.32, Cronbach's α = 0.90). To measure autonomy, participants responded to statements like "I experience a lot of freedom in (insert piped response)," or "I have a lot of choices in (insert piped response)," (M = 25.71, SD = 7.44, Cronbach's α = 0.91). To measure relatedness, participants responded to statements like "I find the relationships I build

with other people from my use of (insert piped response) make me happy," and "When I interact or talk with others while using (insert piped response), I feel like I am important," (M = 18.71, SD = 8.27, Cronbach's α = 0.94).

Enjoyment. This study explicates enjoyment as satisfaction of intrinsic needs as done by Tamborini and colleagues (2010). To replicate this approach, the use of the Interest/Enjoyment scale associated with the Intrinsic Motivation Inventory Scale (IMI) was adopted (Deci & Ryan, 2005). Participants responded to statements like "I enjoy doing this activity very much," and "This activity is fun to do," This was a five item, 7-point Likert type scale, ranging from 1-strongly disagree, to 7-strongly agree. (M = 29.18, SD = 6.47, Cronbach's α = 0.83).

Dependent Variables

Technology Efficacy. In order to measure a child's beliefs and confidence with technology use, the efficacy scale was adopted from the Eynon and Malmberg (2011) study. This measurement was based on a four point scale where participants are asked to rate their skills to use the internet on a scale from Bad (1) to Excellent (4) by answering the question: How would you rate your ability to use the Internet?" (Enyon & Malmberg, 2011). For the purposes of this study, this question was re-worded to concentrate on new media devices by asking, "How would you rate your ability to use new media devices?" To further measure technology efficacy, this study also uses the power usage scale (Marathe et al., 2007; McAlearney, Schweikhart, & Medow, 2004). Participants were asked to respond to statements in a four item, 7-point Likert scale like "I make good use of the features on computers or mobile devices" and "I love exploring the features that any technology has to offer," (M = 21.38, SD = 4.62, Cronbach's α = 0.78).

Academic Efficacy/Performance. Academic efficacy was measured using the Patterns of Adaptive Learning Scales (PALS) developed by Midgley and colleagues (2000) to evaluate a child's beliefs about their ability to succeed academically. Academic related perceptions/beliefs are measured using a six item, 7-point Likert type scales, ranging from 1-strongly disagree, to 7-strongly agree. Participants indicated their academic efficacy by answering questions like "I am certain I can master the skills taught in class this year," and "I'm certain I can figure out how to do most the most difficult class work," (M = 24.55, SD = 4.19, Cronbach's α = 0.88). In order to measure participants' academic performance, they indicate their Grade Point Average (GPA) within the survey.

Chapter 4: Results

Correlations

Technology Identity and Need Satisfaction. In order to examine the relationship between need satisfaction motivations and levels of media use, which determines technology identity, a bivariate correlation was conducted. Results showed that "hanging out" patterns of use correlated with competence, r (251) = .24, p<.001, autonomy r (251) = .18, p< .01, and relatedness r (251) = .14, p<.01. "Messing around" patterns of use correlated with competence r (251) = .28, p<.001, autonomy r (251) = .26, p< .001, and relatedness r (251) = .17, p<.01. For the "geeking out" levels of use, correlation results indicate that geeking out activities did not significantly correlate with competence r (251) = .09, p=.14, share a significant correlation with autonomy r (251) = .14, p< .05, and were not significantly correlated with relatedness r (251) = .05, p=.45.

Need Satisfaction and Enjoyment. To test the relationship between need fulfilment and enjoyment a bivariate correlation was conducted. Results show that enjoyment correlates with competence r (251) = .38, p< .001, autonomy r (251) = .24, p< .001, but not with relatedness r (251) = .06, p=.32.

Technology Identity and Technology Efficacy. In order to explore technology identity and media use patterns and how it relates to technology efficacy beliefs a bivariate correlation test was used. Participants "hanging out" media use patterns correlated significantly with technology efficacy r (251) = .17, p< .01. "Messing around" category media use patterns correlated significantly with technology efficacy r (251) = .28, p< .001. However, for participants with "geeking out" media use patterns their technology efficacy scores were only marginally significant r (251) = .12, p= .06.

Since the power usage scale was proposed as a supplemental measure of technological efficacy the media use patterns were tested with this variable. Correlation data suggests that power usage does not correlate to "hanging out" r (251) = .09, p=.17. Power usage did positively correlate to "messing around" media use patterns r (251) = .33, p< .001. Power usage did not significantly correlate with "geeking out" media use patterns either r (251) = .08, p= .20. This measurement of technological efficacy with power usage as a supplemental measurement seems appropriate since technological efficacy is significantly correlated to power usage r (251) = .33, p< .001.

Technology Identity and Academic Efficacy/Performance. To examine the relationship between the independent variables and the dependent variables, a bivariate correlation test was run. Results indicate that "hanging out" usage was not significantly correlated to academic efficacy beliefs r (251) = .07, p=.26. "Messing around" usage was significantly correlated to academic efficacy beliefs r (251) = .13, p< .05. Finally, "geeking out" was negatively correlated to academic efficacy; however, this correlation was not significant r (251) = -.04, p= .58.

Academic performance was measured by students indicating their GPA based on a 4.0 scale. Technology identity and academic performance scores were examined using a bivariate correlation test. Participants with the tendency for "hanging out" patterns of use reported lower GPA scores r (251) = -.09, p= .16. "Messing around" patterns of use were also negatively correlated with GPA scores r (251) = -.03, p= .68. Participants who report "geeking out" levels of use show significant significantly lower academic performance or GPA r (251) = -.17, p< .01. The idea of academic efficacy and GPA as a supplemental measurement is supported since academic efficacy correlates to GPA r (249) = .30, p< .001. For complete correlation table, see Table 1 below.

Table 1. Correlations of variables within the proposed model

	1	2	3	4	5	6	7	8	9	10	11
Technology Efficacy (1)	___										
Enjoyment (2)	.191**	___									
Academic Efficacy (3)	.127*	.156*	___								
Power Usage (4)	.334**	.197**	.535**	___							
Competence (5)	.295**	.384**	.270**	.375**	___						
Autonomy (6)	.296**	.242**	.178**	.340**	.615**	___					
Relatedness (7)	.091	.063	.076	.168**	.216**	.434**	___				
Hanging Out (8)	.166**	.150*	.071	.087	.239**	.181**	.144*	___			
Messing Around (9)	.282	.178**	.130*	.332**	.276**	.261**	.167**	.461**	___		
Geeking Out (10)	.120	.017	-.035	.081	.092	.135*	.048	.418**	.462**	___	
GPA (11)	.065	.099	.295**	.137*	.069	.106	.062	-.089	-.026	-.169**	___

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Confirmatory Factor Analysis: Media Use Patterns and Technological Identity

In order to answer RQ1, which asked whether or not the media use patterns outlined in the Digital Youth Project data could be used to develop reliable, quantitative scales, a confirmatory factor analysis was tested. In order to answer this question, the reliability of each scale was calculated using structural equation modeling in AMOS. First, the composite reliability of each of the media use patterns "hanging out," "messing around," and "geeking out" were calculated. The composite reliability was calculated by creating a composite variable composed of each of the variables on the scale with loadings fixed to "1." The composite reliability for each scale is computed by squaring the implied correlation between the latent variable and the composite variable. The composite reliability for "Hanging out" is p=$.81^2$, α =.66, the composite reliability for "messing around" is p=$.87^2$, α =.76, and the composite reliability for the "geeking out" scale is p=$.90^2$, α =.81.

The next step in conducting the confirmatory factor analysis (CFA) for the media use pattern scales is to evaluate the fit of the measurement models. The "hanging out" model fit statistics are as follows, χ^2 = 2.24, *df* = 2, *p* =.33, SRMR =. 0218, CFI =.998, CMIN = 1.12, RMSEA = .022 (90% CI: .00-.13). All of these fit statistics indicate a good fitting model. In addition, the absolute value of the residual covariances were not large, indicating no sources of strain and that the model was not mis-specified. Next, the parameter estimates were analyzed. None of the standardized regression weights or the variances exceeded 1; therefore no Heywood cases were in the model. Finally, none of the modification indices output did not suggest any variables or error terms to co-vary.

The "messing around: model fit statistics are, χ^2 = 130.50, *df* = 20, *p*<.001, SRMR =. 0886, CFI =.74, CMIN = 6.52, RMSEA = .15 (90% CI: .13-.17). The fit statistics do not indicate a good fitting model. The absolute value of the residual covariances were larger for several of the variables, the largest was with reading/following the news and searching for information on interesting topics (4.11), suggesting the model may have been mis-specified. Next the parameter estimates and variances were analyzed. None of the standardized regression weights or variances exceeded 1; therefore no Heywood cases were in the model. Finally, modification indices output suggested that several errors co-vary. For future analyses with this scale, several of the error terms will need to co-vary. These results do not indicate a good overall fitting model; however, for the purposes of this study, we will continue to use this set of use patterns to analyze "messing around" technological identity. Further discussion of the model fit statistics will be addressed later.

The "geeking out" model fit statistics are, χ^2= 81.88, *df* = 14, *p*<.001, SRMR =. 0688, CFI =.87, CMIN = 5.85, RMSEA = .14 (90% CI: .11-.17). These statistics do not indicate a

good fitting model. The absolute values of the residual covariances were larger for several of the variables; the largest was with editing photos and composing music lyrics (2.05), suggesting the model may have been mis-specified. Next the parameter estimates and variances were analyzed. None of the standardized regression weights or variances exceeded 1; therefore no Heywood cases were in the model. Finally, modification indices output suggested that several errors co-vary. For future analyses with this scale, several of the error terms will need to co-vary. These results do not indicate a good overall fitting model; however, for the purposes of this study, we will continue to use this set of use patterns to analyze "messing around" technological identity.

The next step in evaluating the CFA results for patterns of media use is to construct a measurement model, inclusive of each level of use. The measurement model fit statistics are as follows χ^2= 417.09, *df* = 149, *p*<.001, SRMR =. 0788, CFI =.80, CMIN = 2.80, RMSEA = .09 (90% CI: .08-.10). Next, the UVI constraints were used to signify perfect correlation between the models, creating a nested model. The fit statistics for that model were χ^2= 618.31, *df* = 152, *p*<.001, SRMR =. 0950, CFI =.64, CMIN = 4.07, RMSEA = .11 (90% CI: .10-.12). Since these models are nested models, the χ^2 difference test was used to compare the two models χ^2 difference = 201.22, *df* = 3, p<.001. Therefore, the three factor model is significantly better than the one factor model. We will proceed to use the three factor model to test convergent and discriminant validity.

The correlation between "hanging out" and "messing around" latent variables (φ) is = .59, *p*<.001, "messing around" and "geeking out" latent variable correlation is (φ) is = .55, *p*<.001, and "geeking out" and "hanging out" latent variable correlation is (φ) is = .61, *p*<.001. Each of the correlations between latent variables was statistically significant, this providing evidence of convergent validity. The 3-factor model is significantly better than the 1-factor

model, χ^2 difference = 201.22, *df* = 3, p<.001. In other words, the model is a better fit when "hanging out," "messing around" and "geeking out" are not redundant. Hence, we have evidence of discriminant validity. These results answer RQ1, confirming the theory driven treatment of these patterns of use as three distinct patterns of use.

Technology Efficacy as Power Usage

To answer H1, which proposed that technological efficacy is a function of power usage, and these two variables will be significantly, positively related, the regression paths of the model were tested. As predicted, there was a positive, significant associations between technological efficacy and power usage (β =.17, p<.05). H1 was supported. The positive, significant correlation between technological efficacy and power usage r (249) = .33, $p<.001$ in addition to the significant relationship between technological efficacy as a significant predictor of power usage supports the assumption that these measures reflect the same concept.

After analyzing the descriptive statistics and distribution values for these variables, power use emerged as a more normally distributed measure. For technological efficacy (*M* = 4.39, *SD* = .05) there was evidence of skew (-1.39) and the data appear leptokurtic (2.56). For power usage (*M* = 5.60 *SD* = .08) there was also evidence of skew (-1.29) and with evidence of leptokurtosis as well (1.96), see Appendix B and C for graphs. In this analysis, power usage is the more normally distributed variable since the skewness and kurtosis fall closer to being within the acceptable range, and thus power usage will serve as a better measure. For future analyses, technological efficacy will be replaced with the power usage measurement.

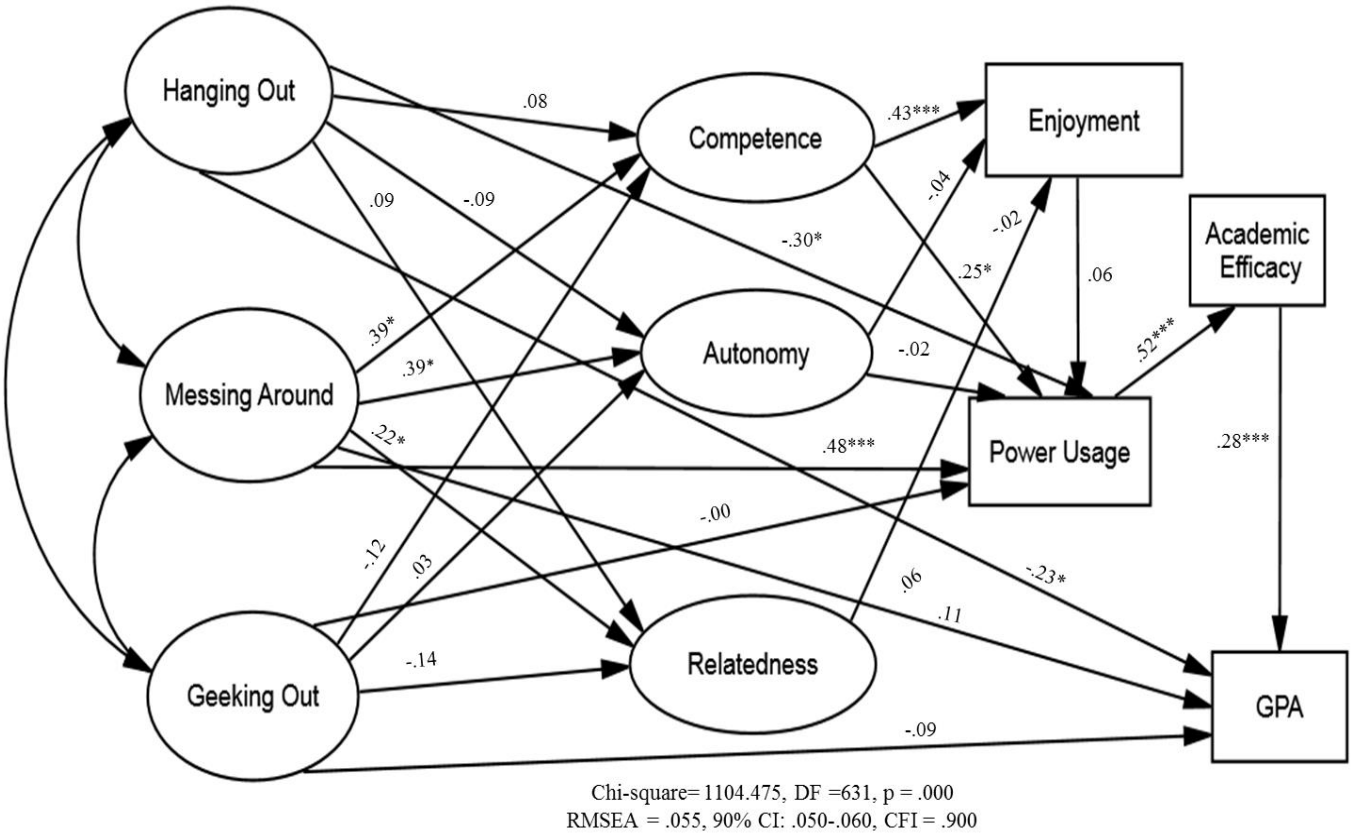
Proposed Model Results

Although the correlation results indicate relationships between the variables, there needs to be a more nuanced analysis to understand the relationships between the variables while controlling for the other variables within the model. A zero-order correlation will not suffice as an appropriate means to answer the remaining research questions. The proposed model in Figure 1 was tested using a Structural Equation Modeling analysis with AMOS 21 statistical software. Figure 2 displays the standardized path coefficients for the predicted model to address RQ2-RQ5. In order for the data to be considered consistent with the proposed model the path coefficients were tested to reveal direction and magnitude. Second, model fit indices were tested to determine whether they fall within acceptable ranges. Figure 2 displays the standardized path coefficients for the proposed model with all variables included.

The analysis began with ensuring that criteria was met for model fit that include a minimum discrepancy statistic ˆC (CMIN) below 2.00 (Byrne, 1994), root mean square error of approximation (RMSEA) below .08 (Brown & Cudeck, 1993), Standardized Root Mean Square Residual (SRMSR) below .10 (Blessing, 1995) and comparative fit index (CFI/df) above .90 (Bentler, 1992). The proposed model fit statistics were as follows: χ^2 = 1304.37, *df* = 643, *p*<.001, SRMR =. 0727, CFI =.86, CMIN = 2.03, RMSEA = .06 (90% CI: .05-.07). These model fit statistics are not ideal. Therefore, the results of the measurement model confirmatory factor analysis modification indices that suggest correlating error terms were included. This correlation of the error terms suggests that the factors specified may not be one-dimensional. This modification indices output may be the result of a multi-dimensional scale or an artifact of the same words (i.e., “blog”, “creative”, “music”) occurring in the scale items. For the purposes of remaining in line with DYP data and the CLT the scales will remain uni-dimensional, with some

error terms correlated. After correlating some of the error terms as suggested by modification indices calculations the new model fit statistics were: χ^2= 1104.45, *df* = 631, *p*<.001, SRMR =. 0740, CFI =.90, CMIN = 1.75, RMSEA = .05 (90% CI: .05-.06). These fit statistics are indicative of a good fitting model. Now that these standards are met, the rest of the SEM analyses will be calculated. See Figure 2 below for model results.

Figure 2. Proposed Connected Learning Model Results



***. Path is significant at the *p*<0.001 level.

*. Path is significant at the *p*<0.05 level.

As the figure above demonstrates, enjoyment, power usage, academic efficacy and GPA are all drawn as observed variables. The rationale for drawing the multi-item scales, enjoyment, power usage and academic efficacy as observed variables is because each of these sub-scales were adopted from established, reliable scales. The reliabilities of each of these variables, power usage (α = *.78)*, enjoyment (α = *.83)*, academic efficacy (α = *.88)* are strong enough to suggest that the scales reflect the same concept. In order to err on the side of parsimony, each of these variables were treated as observed variables. For full model results from AMOS output, see Appendix D.

Technological Identity and Need Fulfillment

RQ2 sought to understand the relationship between a youth's technology identity and their perceived need fulfillment from media use. For the first level of technology identity, "hanging out," there were no positive, significant associations with competence (β = .08, p = .51), autonomy (β = -.09, p = .43), and relatedness (β = .09, p = .41). The second technology identity, "messing around," had a significant, positive relationship with competence (β = .39, p<.01) and autonomy, (β = .39, p<.01), and marginally significant with relatedness (β = .22, p=.05). The third technology identity "geeking out" did not have significant, relationships with any of competence (β = -.12, p = .26), autonomy, (β = -.03, p = .78) or relatedness (β = -.14, p = .19). To answer RQ2, the only level of use that significantly corresponds with need fulfillment is the "messing around" level of use.

Enjoyment as Need Fulfillment

To address RQ3, this study will examine whether or not need fulfilment variables mediate the relationship between technology identity and enjoyment. Bootstrapping tests were conducted to examine whether the proposed mediators, autonomy, competence, or relatedness

had significant indirect effects on the technology identities and enjoyment. To investigate the effect of the mediating variables of competence, autonomy, and relatedness on each of the technological identities and enjoyment, an SEM model with direct paths and indirect paths were analyzed. After conducting a bootstrapping test the test for indirect effects for competence, the significance levels were as follows: hanging out ($p = .43$), messing around ($p < .01$), geeking out ($p = .42$). These results indicate full mediation for competence between messing around and enjoyment. To answer RQ 3, need fulfilment is mediates the relationship between the messing around level of use, however, not for "hanging out" or "geeking out."

Technological Identity, Need Fulfillment, Enjoyment and Power Use

The next step is to answer RQ4, which asked how technology identity influences need fulfillment, enjoyment and power usage. The significant paths are discussed here and Figure 2 displays all significant and insignificant path coefficients. Each of the technology identities on need fulfilment relationships were outlined in the H1 results mentioned above. To reiterate the only significant relationships between patterns of use and need fulfilment were among messing around users on competence, autonomy, and marginally on relatedness.

The next step in answering RQ4 is exploring the relationship between need fulfilment and enjoyment. Yes, the indirect effects between levels of use and enjoyment with need fulfilment were analyzed in RQ3; however, the standardized regression weights must still be considered. Competence is a significant predictor of enjoyment ($\beta = .43$, $p < .001$). However, neither autonomy ($\beta = -.04$, $p = .67$) or relatedness ($\beta = -.02$, $p = .73$) are significantly related to enjoyment. The next step is to analyze the relationship between technology identity and power usage. SEM model results indicate a significant negative relationship between hanging out (β = -

.30, p<.01) and power usage. A significant positive relationship emerged between messing around (β = 48, p<.001) and power usage. No positive, significant relationship was found between geeking out (β = -.00, p =.99) and power usage.

The final analysis needed to answer RQ4 is to examine the relationship between need fulfillment and power usage. Ostensibly, fulfilment of competence, autonomy, or relatedness needs could predict power usage. Therefore, the model includes paths were drawn from these variables to power usage. The results indicate that there was a significant path between competence (β = .25, p<.05) and power usage. The paths between usage and autonomy (β = -.02, p =.82), and relatedness (β = .06, p =.43) were not significant. In sum, the answer to RQ4 is that those users in the messing around stage have significant relationships between their use of media and their experience of need fulfilment. In addition, fulfilment of competence needs lead to enjoyment. Finally, hanging out levels of use are significantly negatively associated with power usage, while messing around activities are significant predictors of power usage. Lastly, competence is a significant predictor of power usage.

Informal Technology use and Formal Learning Connections

The final step in the analysis is to answer RQ5 by exploring the overall relationship that technology use can have with a student's formal academic beliefs and outcomes. Considering the Connected Learning Theory's proposition that children's media use patterns have the capacity to inform their academic patterns of behavior, direct paths were drawn between use and GPA. The results are as follows: "hanging out" (β = -.23, p<.05) was a significant negative predictor, while "messing around" (β = -.11, p =.30) and "geeking out" (β = -.09, p =.34) were not. The proposed model also outlines a direct path from power use to academic efficacy. This path is based on the

assumption that if youth can build confidence in their technology use, they can also build confidence in their ability to succeed in the classroom. As predicted, power usage is a positive, significant predictor of academic efficacy (β = .52, p<.001). In addition, this model proposes academic efficacy as a predictor of academic performance or GPA; this assumption was also supported (β = .28, p<.001).

The next step to understand the mechanisms in which informal technology use may relate to formal academic beliefs or performance is to conduct a test of indirect effects using the bootstrapping method. Test of indirect effects indicate significant indirect paths between messing around and academic efficacy (p<.001) as well as GPA (p<.001). Significant tests of indirect effects were found on the hanging out variable for academic efficacy (p<.05), and GPA (p<.05). Also, a there were significant indirect paths between competence and academic efficacy (p<.01), and GPA (p<.05). For all mediation results, see Table 2 below. In sum, to answer RQ5, there are indeed connections between technology use and academic performance. There are direct paths as well as several different indirect paths that connect informal technology uses with formal academic performance.

Table 2. Standardized Indirect Effects- Two Tailed Significance

	Geeking Out	Messing Around	Hanging Out	Relatedness	Autonomy	Competence	Enjoyment	Power Use	Academic Efficacy
Relatedness	...	...	...	...	...	...	...	...	...
Autonomy	...	...	...	...	...	...	...	...	...
Competence	...	...	...	...	...	...	...	...	...
Enjoyment	.2690	.0135	.5230	...	...	...	...	...	...
Power Use	.1857	.0096	.5802	.4316	.5038	.4393	...	...	...
Academic Efficacy	.6485	.0009	.0405	.4448	.8662	.0083	.4348	...	...
GPA	.6305	.0009	.0294	.4299	.8250	.0051	.3714	.0008	...

Control Variable: Age

The participants in this study vary across a broad age range (10-17) and it is logical to conclude that older children may not have the same media use patterns as younger children. To address the possible confounding variable of age, an additional analysis was performed, controlling for age on each of the mediating and dependent variables. The model fit statistics were: χ^2 = 1147.67, *df* = 662, *p*<.001, SRMR =.0732, CFI =.90, CMIN = 1.75, RMSEA = .05 (90% CI: .05-.06). In addition, there were no significant relationships between age and competence, (β = -.04, *p* =.51), autonomy (β = -.09, *p* =.17), relatedness (β = -.09, *p* =.17), enjoyment (β = -.09, *p* =.14), power use (β = .03, *p* =.59) or academic efficacy (β = -.05, *p* =.33). These results indicate that age does not confound the relationships that were specified in the model between technological identity and need fulfilment, enjoyment, power usage and

academic efficacy. However there was a significant negative relationship between age and GPA (β = -.17, p<.05). This result indicates that older youth reported lower GPA scores; since age was not related to patterns of usage this does not appear to have distorted the findings. Regardless of age, the media use patterns had the same effect on need fulfilment, enjoyment, power usage and academic efficacy.

Chapter 5: Conclusion

Summary of Findings. In sum, this study presents two reliable, quantitative scales for measuring two of the three youth technological identities (messing around and geeking out) outlined the Digital Youth Project data. Composite reliability for the scales as presented in the model lends marginal support for the formation of a reliable scale for messing around. However, the confirmatory factor analysis results suggest that these measures be treated as three distinct factors, supporting the discriminant validity of the scale. In addition, the data indicate significant relationships the relative frequency of "messing around" behaviors and reported levels of competence, relatedness and autonomy from their media use and consumption. It is worthy to note the insignificant relationships between the frequent "hanging out" and "geeking out" patterns of media use and need fulfilment. Interpretation of these results will be discussed later in this chapter.

Furthermore, this study successfully highlights need fulfilment as a mediator of enjoyment for children engaged in "messing around" behaviors. This finding addresses the research question of whether or not enjoyment can be measured as fulfillment of basic psychological needs in the affirmative. Moreover, there exists a positive, significant relationship between competence need fulfillment and enjoyment. Several interesting patterns and relationships emerged among the power usage variable as well. Data indicates that hanging out usage is significantly negatively associated with power usage, while messing around activities are significant positive predictors of power usage. Among the need fulfilment variables, competence emerged as a significant predictor of power usage.

Finally, these data indicate affirmation to the overarching question of whether or not there are connections between a child's informal technology use and formal academic outcomes. Hanging out patterns of use are significantly negatively related to youth GPA scores, which is an important guideline to consider when scaffolding child media use patterns. Another interesting finding was that the geeking out participants reported lower GPA scores. Interpretation of these results will be further discussed as well. In addition, power usage emerged as a significant predictor of academic efficacy. Academic efficacy is significantly related to GPA. There are several indirect paths that emerged between media use and academic efficacy. There is a significant indirect relationship with messing around and hanging out uses, through need fulfilment, enjoyment and power use to academic efficacy and GPA. Also power usage and competence lead to significant indirect paths to academic outcomes.

As a precautionary measure, this study also addressed the possible confounding variable of age. The proposed model was modified to include the age variable on each of the need fulfilment, enjoyment, power usage, academic efficacy, and GPA. Model fit statistics were not significantly altered by this control variable. There was no significant relationship between age and autonomy, competence, relatedness, enjoyment, power usage, or academic efficacy. These insignificant findings indicate that age is not a confounding variable in those relationships. On the other hand, the relationship between age and GPA was significant. This negative significant relationship is not surprising since students in 4^{th} and 5^{th} grade are not balancing as much as the older students, nor are they enrolled in courses with as much rigor as the older participants. Even though age is a confounding variable for GPA, that does not alter the theoretical structure of the study. Prior research has identified GPA as an outcome variable as a particularly weak measure, since it can be influenced by many different factors (i.e. parental investment, school policy,

course/teacher difficulty, etc.) (Ferguson, 2011). In a study with a similar sample of African American participants similar results were found that age did not affect the nature or academic benefits of Internet use (Jackson et al., 2009).

Interpretation of Findings. As previously stated, the goal of this study is to develop reliable, quantitative measures for advancing the Connected Learning Theory by using the data from the Digital Youth Project. The objective behind developing a measurement for the technological identities outlined in the DYP is to galvanize children's media effects research with a reliable, generalizable scale. The results of this study indicate two reliable scales for identifying youth in the "messing around" and "geeking out" stages. With the establishment of these scales, researchers can better understand the spectrum of how youth are using technology. Not only do these scales make categorizing youth media uses easy, the activities outlined in the scales can shed light on underlying gratifications that youth may experience from their media use. The establishment of reliable scales allows for the establishment of predictive validity to advance research without having to "re-invent the wheel" for future youth media effects research.

For example, many of the children in the "geeking out" stage have a propensity for content creation during their media use time. Meanwhile, youth in the "hanging out" stage are more inclined toward content consumption during their media use. These scales are beneficial, not only for efficiently identifying technological identities, but also individual differences and personality traits among young users. Establishing these scales made it easier to identify the disparity between youth who are engaging in content creation versus those engaged in content consumption.

In addition, the technological identity scales and their subsequent relationships to the mediating and dependent variables were consistent with existing research findings. More specifically, the relationship between levels of media use and internet efficiency beliefs, which, in this study, was measured as power usage, was observed in other youth media studies. Prior research found that those in the "messing around" category reported higher technological efficacy beliefs than those in the "geeking out" category (Ito, 2013). Likewise, Enyon and Malmberg (2011) found that "average" internet users reported much higher internet efficacy beliefs than frequent internet users. An explanation of this finding may be that youth in the "messing around" stage are more aware of their newly acquired and developed technological skills than "geeking out" users. Those youth in the "geeking out" stage make such sophisticated use of technology so often that they have developed a level of expertise (Ito, 2010a).

Another explanation as to why children who are not as sophisticated as the "geeking out" users but report higher confidence with technology could be that these users may have a completely different frame of reference. There is the chance that "messing around" users who are reporting higher confidence and power usage scores than "geeking out" kids are may be because they are comparing themselves to their peers or "hanging out" counterparts. Those youth in the "geeking out" stage perhaps judge their technological sophistication based on how experts and professionals in the field are performing. For "geeking out" users, the questions in this survey may not reflect their sentiments about what it means to be technologically savvy or a power user.

The findings in this study that suggest need fulfillment, autonomy and competence are experienced more by those youth in the "messing around" stage also make theoretical sense. Ito's (2010a) findings from the Digital Youth Project indicate that "hanging out" users and geeking out" users have the tendency to be externally motivated. The "hanging out" patterns of

media use are consistent with friendship-driven motivations which are externally motivated, (Ito, 2010a). The primary goal in this level of use is not to make sophisticated use of new media, but to keep tabs on friends or to use on-line tools to coordinate or assimilate offline interactions. The same follows with "geeking out" levels of media use. The DYP documents these users as having acquired "geek cred" for their expertise (Ito, 2010a). This geek cred can come in the form of recognition from peers; this recognition can also include payment for their services.

According to the principles outline in the Self-Determination Theory, these gratifications outlined in the "hanging out" and "geeking out" stage of use are fueled by external motivations (i.e. to satisfy friends and monetary payment), rather than internal motivation (Deci & Ryan, 2000). However, the interest-driven motivations that youth in the "messing around" stage experience (i.e. conducting a Google search for a homework problem and navigating from link to link in an open ended search) represent a genuine curiosity in finding out the answer to a problem and exploring various navigation tactics. These processes represent interest-driven patterns of use and thus align with this study's findings on autonomy and competence.

Considering the internal satisfaction of mastering these aforementioned search and knowledge skills, it is also reasonable to understand the finding that autonomy and competence mediate the relationship between "messing around" users and enjoyment. This finding is consistent with several existing studies that explicate enjoyment as a form of need satisfaction (Reiss & Wiltz, 2004; Oliver & Sanders, 2004; Grodal, 2000). For the most part, youth in the "messing around" stage seemingly get the most satisfaction and enrichment from their media use. This is a positive thing and a possible avenue for youth who are disenfranchised in the classroom to find a positive outlet via their media use. Furthermore, the data from this study dispels the DYP assumption that since "geeking out" is the most sophisticated use of media,

youth in that category are "better off." The opposing results from this study of geeking out being negatively related to relatedness may indicate that youth in that category have a more difficult time in social settings. Perhaps there are dominant social norms and expectations among these adolescents that ostracize youth in the "geeking out" stage.

The insignificant findings between hanging out and relatedness and geeking out and competence seem to be counter intuitive and paradoxical. However, prior youth media effects research supports these findings. Pea and colleagues (2012) found that the more time 8-12 year old girls spent doing social or "hanging out" activities online, the less satisfied and happy they were with their lives. This finding is consistent with the insignificant relationship between relatedness and hanging out in this study. This suggests that technology may not be critical for the youth in this sample to connect with their peers.

An additional explanation as to why the atypical findings between technological identities and reported need fulfilment exist may be because of the survey design. The beginning of the survey asked participants to list their three favorite media activities. These activities were then randomly piped into the need fulfilment scale items. For example, if a participant listed "Flappy Birds" as one of their favorite activities, then this response could have been inserted in the competence item as " When I interact or talk with others while using (Flappy Bird), I feel like I am important."

This undoubtedly could have caused some inconsistency in relatedness scores. Also, if a participant was in the "geeking out" stage, there is a chance that their favorite activities listed are not the activities they geek out on. It would behoove future researchers to have participants recall an activity in each of the relatedness, autonomy, and competence categories and evaluate the relationships from there. Participants in this study consistently listed games as their favorite

activity, which may have hindered the opportunity to explore those authentic geeking out activities.

Perhaps the most salient contribution of this study is the finding that power usage is a significant predictor of academic efficacy and that academic efficacy is positively significantly related to academic performance. The Connected Learning Theory is rooted in the premise that youth new media uses have the capacity to transform the way they are empowered to negotiate in their educational environments (Ito et. al, 2013). This finding of power usage beliefs and academic efficacy may be an advantageous variable of observation rather than levels of use or technological identity. None of the technological identities were significantly related to academic efficacy or GPA. This finding helps dispel that myth that the more children use technology, the smarter they become.

As a matter of fact, those children who report "geeking out" levels of use reported lower academic efficacy and performance. This may be the result of a significant amount of their time outside school may be dedicated to media use and consumption. The time that these youth are spending with their media, the less time they are dedicating to homework, studying, or focusing on academic performance. Therefore, a negative relationship between youth in the "geeking out" stage and GPA is no indication of intelligence or lack thereof. More than likely, these children are highly intelligent. However, they may dedicate their time and intellectual talent to developing their technology skills, at the expense of performing well in the classroom. Prior youth media research affirms this finding as well. Hastings and colleagues (2009) found that time spent playing video games were negatively related to school competence. The results from this study suggest that excessive game play time is related to a decrease in academic outcomes (Hastings et al., 2009).

Chapter 6: Discussion

Theoretical and Practical Implications. In addition to lending empirical support to the existing scholarship and proposing a quantitative component to the Connected Learning Theory, this study also has several theoretical and practical implications. The sample is composed of majority African American participants (n = 205). This is a unique contribution to the scholarship of youth media studies because this is an underrepresented population. Media effects research exploring the ways in which new media technology empowers minorities is nascent. The implications from these data suggest solutions to closing the achievement gap through the efficient use of new media devices. In addition, this study introduces a novel approach to understanding youth technology use and academic outcomes. These findings differ from Ito's findings with children in the Silicone Valley and it may be because this sample is more representative of a typical American student. The capturing of media use patterns and the effects captured in different setting, like the one here, suggest a threshold for sophisticated media use that allows youth to still be socially accepted among peers.

The results of this data, especially the indication of significant indirect paths, have the capacity to contribute to the ongoing debate as to whether or not new media devices can be used as a tool for learning enhancement. The exploration of these relationships can work to dispel the learning-by-osmosis myth by highlighting specific avenues that contribute to youth media use connecting with academic outcomes. The Connected Learning Theory hypothesizes a relationship between children's interactions with new media and the ability to influence other contexts, like the formal academic environment. The results of this study not only confirm this proposition, but highlight specific paths by which these connections can be identified. The results of this study suggest that youth who report higher scores on power usage scales also

report higher academic efficacy beliefs. This finding will be beneficial in advancing media effects scholarship as well as the Connected Learning Theory. This finding suggests that building confidence in a child's ability to take advantage of technology features can also build confidence in their ability to succeed in the classroom.

Practical design implications would be new media programs, targeted to youth, which encourage them to explore new features, use new features of the program, and download upgrades so that using the device comes easier. For parents who wish to ensure that their children realize beneficial academic outcomes from their media use, it will be crucial to encourage them to use media for more than just social, hanging-out patterns of use. Ideally, there should be the space and opportunity for youth to use media in the "messing around" manner. Those who use media for not only for its social affordances but also for the capacity of information gathering and search inquiry demonstrate messing-around behaviors. This level of use will lead to more intrinsic need satisfaction, and motivation for continued use. In addition, those who use media at the messing around level will experience more enjoyment.

Educators and parents can play an active role in scaffolding youth for meaningful media use by giving them positive feedback, which allows them to experience the intrinsic need of competence. Competence is important because the data from this study indicate significant relationships between experiencing competence fulfillment and enjoyment. The most important practical suggestion is encouraging children to be power users. As the data suggest, those who can build their competence in technology use may also increase their confidence in their ability to succeed academically. The more academic efficacy youth have, the higher their GPA scores.

Study Limitations. Although the results of this study contribute to the body of existing knowledge about youth new media practices, there are several limitations to note. First, the low internal consistency of the "hanging out" media use patterns scale. This low reliability ($\alpha = 0.62$) is unacceptable and therefore not a reliable scale. This lack of reliability very well may have negatively impacted all subsequent analyses using this scale. Future studies should re-examine the Digital Youth Project data to identify more "hanging out" media use patterns to construct a more reliable scale. Each of the "messing around" and "geeking out" scales contained 8 and 7 items, respectively. Perhaps, adding more use patterns to the "hanging out" scale would increase reliability and many of the other relationships that youth in the "hanging out" category had with need fulfillment, technological efficacy, power usage, and academic efficacy/performance.

In addition to the marginal reliability of the "hanging out" variable, the lack of diversity within the sample is limiting. It would be beneficial to look at various locations and settings for a more exploratory process to understand how informal media use patterns relate to need fulfilment and academic outcomes. A broader, more diverse sample will solidify the opportunity to identify various individual differences, like personality traits, skill sets, socio-economic status, and so forth that influence why youth engage in various levels of media use.

Directions for Future Research. Future research should conduct a quantitative study with a more representative sample across a variety of age ranges to identify the varying ways that technology identity, efficacy beliefs, and academic outcomes work together with new media use patterns. As stated, the limitation of this study is that the sample is made up of all African American students across a few high schools in one area of Louisiana. Broadening the sample will allow for testing individual difference and moderating variables. The significant role that power usage played in the proposed model testing calls for a more nuanced examination of this

variable. Future research should look at power usage as a moderator variable. There is the potential role that power usage can explain why certain youth needs are fulfilled as well as a predictor of their ability to fulfill these needs via media use or consumption. A direction for future analysis with this data would be analyzing the list of media activities that each youth listed in the survey to help explain the weak relationships between the geeking out and hanging out users and the other outcome variables. A study in the future would be one that asks children to recall their need fulfillment from media activities that fall within each of the "hanging out," "messing around," and "geeking out" stages individually. This way, there can be a mutually exclusive examination of media use patterns, specific media activities and need fulfilment.

Future studies should also explore additional mediating variables to identify other ways that youth technology use patterns can lead to formal academic outcomes. As mentioned previously, there can be individual or personality traits that determine media use patterns or guide avenues for seeking need fulfilment. A more comprehensive study would also consider additional dependent variables, other than the academic outcome variables measured here. The counterintuitive results from the data among "geeking out" users may be indicative of an alternate goal orientation for these users. Perhaps, these students are more invested in their creative acts through content creation or mastering technology. This study used GPA as a marker of success among students, and prior research has found that GPA is ultimately a weak indicator with several limitations (Ferguson, 2011).

There is a chance that these outcomes are of more value and importance than having a high GPA, which is why they are willing to spend more time developing these skills at the expense of homework or school related projects. An alternate outcome variable to measure would be participant's confidence in pursuing a technological career or their sense of

empowerment from their technology use. For those more frequent "geeking out" users, considering behavioral intentions, IT career goal aspirations, or confidence in technology in relation to their less sophisticated use peers would highlight some important avenues for educators and parents to effectively scaffold these types of users to develop their talents for broader social impact.

In addition, the results here show that "geeking out" students are not skilled in what's being evaluated in the classroom setting. However, this may be more of a reflection of the school setting than the students in the sample. The DYP data indicated that "geeking out" users were the stronger students. It is important to consider the environment and school atmosphere. The DYP was conducted in an academic environment that encouraged technological efficacy, while this study took place at a school that places heavy emphasis of standardized test score improvement. There may not be as many opportunities or adult-encouraged incentives for children in this school to develop skills in technology. Future studies should survey and compare students from a variety of school environments.

Finally, this study should contain a qualitative component to obtain a more coherent and holistic understanding of exactly what components of new media technologies empower youth. The empowerment potential is not evident from this data; however, the powerful relationships between the "messing around" users and need fulfilment seem to tap into the potential for informal media use to serve as a source of empowerment. This way, education researchers, media effects researchers and new media designers can have clear guidelines as to how to make technology empowering for youth to negotiate positive relationships in broader, social and cultural contexts, especially in the formal classroom setting, further advancing the Connected Learning Theory.

Appendix A: Questionnaire

Q1 Please type in the name of your three favorite games, websites, or programs that you use on smartphones, iPads, or laptops.

Favorite One (1)
Favorite Two (2)
Favorite Three (3)

Q2 Which of the following devices do you USE? (SELECT ALL THAT APPLY)

- ❑ a. iPhone/Smartphone (1)
- ❑ b. iPad/Tablet (2)
- ❑ c. iPod/Mp3 Player (3)
- ❑ d. Laptop (4)
- ❑ e. Desktop (5)
- ❑ f. None of the Above (6)

If f. None of the Above Is Selected, Then Skip To End of Survey

Q3 Which of the following devices do you OWN? (SELECT ALL THAT APPLY)

- ❑ a. iPhone/Smartphone (1)
- ❑ b. iPad/Tablet (2)
- ❑ c. iPod/Mp3 Player (3)
- ❑ d. Laptop (4)
- ❑ e. Desktop (5)
- ❑ f. I don't OWN any of these (6)

Q4 During an average week, how much time do you usually spend using technology? (ONE ANSWER NEXT TO EACH ITEM)

	0-2 Hours (1)	3-5 hours (2)	6-8 hours (3)	9-11 hours (4)	12-14 hours (5)	15 hours or more (6)
a. iPhone/Smartphone (1)	❍	❍	❍	❍	❍	❍
b. iPad/Tablet (2)	❍	❍	❍	❍	❍	❍
c. iPod/Mp3 Player (3)	❍	❍	❍	❍	❍	❍
d. Laptop (4)	❍	❍	❍	❍	❍	❍
e. Desktop (5)	❍	❍	❍	❍	❍	❍

Q5 When thinking about the devices you USE, indicate which of them have Internet/WiFi Access. (ONE ANSWER NEXT TO EACH ITEM)

	Yes, I have Internet/WiFi Access (1)	No, I do not have Internet/WiFi Access (2)
a. iPhone/ Smartphone (1)	❍	❍
b. iPad/Tablet (2)	❍	❍
c. iPod/Mp3 Player (3)	❍	❍
d. Laptop (4)	❍	❍
e.Desktop (5)	❍	❍

Q6 During an average week, how often do you do the following things when using technology? (ONE ANSWER NEXT TO EACH ITEM) 1=Never to 7=Often

	1- Never (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7-Often (7)
a. Chatting online (1)	❍	❍	❍	❍	❍	❍	❍
b. Spending time on social media sites (Facebook, Twitter, Instagram) (2)	❍	❍	❍	❍	❍	❍	❍
c. Sending and recieving emails (3)	❍	❍	❍	❍	❍	❍	❍
d. Posting comments or messages to a webpage/blog (4)	❍	❍	❍	❍	❍	❍	❍

Q7 During an average week, how often do you do the following things when using technology? (ONE ANSWER NEXT TO EACH ITEM) 1=Never to 7=Often

	1-Never (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7-Often (7)
a.Looking for information on a topic that interests you (1)	❍	❍	❍	❍	❍	❍	❍
b. Researching products you would like to buy or own (2)	❍	❍	❍	❍	❍	❍	❍
c. Reading/keeping up with the news (3)	❍	❍	❍	❍	❍	❍	❍
d. Buying products online (4)	❍	❍	❍	❍	❍	❍	❍

Q8 During an average week, how often do you do the following things when using technology? (ONE ANSWER NEXT TO EACH ITEM) 1=Never to 7=Often

	1-Never (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7-Often (7)
a. Watching TV/Netflix on demand on the computer (1)	❍	❍	❍	❍	❍	❍	❍
b. Watching videos (YouTube) on the computer (2)	❍	❍	❍	❍	❍	❍	❍
c. Downloading or streaming music (3)	❍	❍	❍	❍	❍	❍	❍
d. Playing online games/applications (4)	❍	❍	❍	❍	❍	❍	❍

Q9 During an average week, how often do you do the following things when using technology? (ONE ANSWER NEXT TO EACH ITEM) 1=Never to 7=Often

	1-Never (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7-Often (7)
a. Using a mobile device for creative writing/blogging (1)	❍	❍	❍	❍	❍	❍	❍
b. Writing or composing music or lyrics (2)	❍	❍	❍	❍	❍	❍	❍
c. creative drawing or improving or editing photos (3)	❍	❍	❍	❍	❍	❍	❍

Q10 During an average week, how often do you do the following things when using technology? (ONE ANSWER NEXT TO EACH ITEM) 1=Never to 7=Often

	1-Never (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7-Often (7)
a. Writing your own blog (1)	❍	❍	❍	❍	❍	❍	❍
b. Adding or changing content in a wiki or webpage (2)	❍	❍	❍	❍	❍	❍	❍
c.Putting podcasts, music, or videos on the Internet (3)	❍	❍	❍	❍	❍	❍	❍
d. Reading a blog (4)	❍	❍	❍	❍	❍	❍	❍

Q32 Which of the following describes your favorite TYPE of computer activity?

- ❍ a. Educational Games/Websites (1)
- ❍ c.Music/Video Websites (i.e. Youtube, Spotify, SoundCloud) (2)
- ❍ f. Social Networking Sites (i.e. Facebook, Instagram, Twitter) (3)
- ❍ g.Blog Websites (i.e. WordPress, Blogger, SquareSpace) (4)
- ❍ b.Non-Educational Games/Websites (5)
- ❍ e. Other (6)
- ❍ d.Movies/TV Sites(Netflix, Hulu,AmazonPrime) (7)
- ❍ e. Shopping Websites (8)

Q11 In thinking about your favorite TYPE of activity you just selected, which device are you most often using to use it? (ONE ANSWER ONLY)

- ❍ a. iPod/Mp3 Player (1)
- ❍ b. iPad/Tablet (2)
- ❍ c. iPhone/Smartphone (3)
- ❍ d. Laptop (4)
- ❍ e. Desktop (5)

Q12 Think about the role your parents have in your computer or mobile media use. 1-Never to 7-Often

	1-Never (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7-Often (7)
How often will your parent(s) watch or monitor your computer activity? (1)	❍	❍	❍	❍	❍	❍	❍

Q13 When thinking about ${q://QID23/ChoiceTextEntryValue/1}, please answer the following statements.

	Strongly Disagree (1)	Disagree (2)	Somewhat Disagree (3)	Neither Agree nor Disagree (4)	Somewhat Agree (5)	Agree (6)	Strongly Agree (7)
I enjoy doing this activity very much (1)	❍	❍	❍	❍	❍	❍	❍
This activity is fun to do. (2)	❍	❍	❍	❍	❍	❍	❍
I think this was a boring activity. (3)	❍	❍	❍	❍	❍	❍	❍
This activity does not hold my attention at all. (4)	❍	❍	❍	❍	❍	❍	❍
I think this activity is quite enjoyable. (5)	❍	❍	❍	❍	❍	❍	❍

Q35 When thinking about ${q://QID23/ChoiceTextEntryValue/2}, please answer the following statements.

	Strongly Disagree (1)	Disagree (2)	Somewhat Disagree (3)	Neither Agree nor Disagree (4)	Somewhat Agree (5)	Agree (6)	Strongly Agree (7)
I enjoy doing this activity very much (1)	❍	❍	❍	❍	❍	❍	❍
This activity is fun to do. (2)	❍	❍	❍	❍	❍	❍	❍
I think this was a boring activity. (3)	❍	❍	❍	❍	❍	❍	❍
This activity does not hold my attention at all. (4)	❍	❍	❍	❍	❍	❍	❍
I think this activity is quite enjoyable. (5)	❍	❍	❍	❍	❍	❍	❍

Q36 When thinking about ${q://QID23/ChoiceTextEntryValue/3}, please answer the following statements.

	Strongly Disagree (1)	Disagree (2)	Somewhat Disagree (3)	Neither Agree nor Disagree (4)	Somewhat Agree (5)	Agree (6)	Strongly Agree (7)
I enjoy doing this activity very much (1)	❍	❍	❍	❍	❍	❍	❍
This activity is fun to do. (2)	❍	❍	❍	❍	❍	❍	❍
I think this was a boring activity. (3)	❍	❍	❍	❍	❍	❍	❍
This activity does not hold my attention at all. (4)	❍	❍	❍	❍	❍	❍	❍
I think this activity is quite enjoyable. (5)	❍	❍	❍	❍	❍	❍	❍

Q15 Please indicate how much you agree with the following statements.

	Strongly Disagree (1)	Disagree (2)	Neither Agree nor Disagree (3)	Agree (4)	Strongly Agree (5)
1.I'm certain I can master the skills taught in class this year. (1)	❍	❍	❍	❍	❍
2. I'm certain I can figure out how to do the most difficult class work. (2)	❍	❍	❍	❍	❍
3. I can do almost all the work in class if I don't give up. (3)	❍	❍	❍	❍	❍
4.If I have enough time, I can do a good job on all my classwork. (4)	❍	❍	❍	❍	❍
5.Even if the work is hard, I can learn it. (5)	❍	❍	❍	❍	❍
6. II'm certain I can figure out how to do the most difficult classwork. (6)	❍	❍	❍	❍	❍

Q16 Please read the statements carefully and choose an option that represents your view on the statement.

	Strongly Disagree (1)	Disagree (2)	Somewhat Disagree (3)	No Opinion (4)	Somewhat Agree (5)	Agree (6)	Strongly Agree (7)
I make good use of the features on computers or mobile devices. (1)	❍	❍	❍	❍	❍	❍	❍
I always have the latest technology upgrades. (2)	❍	❍	❍	❍	❍	❍	❍
I love exploring the features that any technology has to offer. (3)	❍	❍	❍	❍	❍	❍	❍
Using any technology device comes easy to me. (4)	❍	❍	❍	❍	❍	❍	❍

Q17 How would you rate your ability to use technology?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)
Bad:Excellent (1)	❍	❍	❍	❍	❍

Q18 When thinking about ${q://QID23/ChoiceTextEntryValue/2} indicate how much you agree with the following statements.

	Strongly Disagree (1)	Disagree (2)	Somewhat Disagree (3)	Neither Agree nor Disagree (4)	Somewhat Agree (5)	Agree (6)	Strongly Agree (7)
I think I am pretty good at ${q://QID23/ChoiceTextEntryValue/2}. (1)	❍	❍	❍	❍	❍	❍	❍
After working at ${q://QID23/ChoiceTextEntryValue/2}, I felt pretty competent. (2)	❍	❍	❍	❍	❍	❍	❍
I am satisfied with my performance at ${q://QID23/ChoiceTextEntryValue/2}. (3)	❍	❍	❍	❍	❍	❍	❍
I am pretty skilled at ${q://QID23/ChoiceTextEntryValue/2}. (4)	❍	❍	❍	❍	❍	❍	❍
${q://QID23/ChoiceTextEntryValue/2} keeps me busy but does not overwhelm me. (5)	❍	❍	❍	❍	❍	❍	❍

Q19 When thinking about ${q://QID23/ChoiceTextEntryValue/2} indicate how much you agree with the following statements.

	Strongly Disagree (1)	Disagree (2)	Somewhat Disagree (3)	Neither Agree nor Disagree (4)	Somewhat Agree (5)	Agree (6)	Strongly Agree (7)
${q://QID23/ChoiceTextEntryValue/2} provides me with interesting options and choices. (1)	❍	❍	❍	❍	❍	❍	❍
I experience a lot of freedom in ${q://QID23/ChoiceTextEntryValue/2}. (2)	❍	❍	❍	❍	❍	❍	❍
I have a lot of choices ${q://QID23/ChoiceTextEntryValue/2} (3)	❍	❍	❍	❍	❍	❍	❍
I am able to use ${q://QID23/ChoiceTextEntryValue/2} the way I want to use it. (4)	❍	❍	❍	❍	❍	❍	❍
I do things in ${q://QID23/ChoiceTextEntryValue/2} because they interest me (5)	❍	❍	❍	❍	❍	❍	❍

Q20 When thinking about ${q://QID23/ChoiceTextEntryValue/2} indicate how much you agree with the following statements.

	Strongly Disagree (1)	Disagree (2)	Somewhat Disagree (3)	Neither Agree nor Disagree (4)	Somewhat Agree (5)	Agree (6)	Strongly Agree (7)
I find the relationships I build with other people from my use of ${q://QID23/ChoiceTextEntryValue/2} make me happy. (1)	❍	❍	❍	❍	❍	❍	❍
When I interact or talk with others while using ${q://QID23/ChoiceTextEntryValue/2} I feel close to them (2)	❍	❍	❍	❍	❍	❍	❍
When I interact or talk with others while using ${q://QID23/ChoiceTextEntryValue/2} I feel understood. (3)	❍	❍	❍	❍	❍	❍	❍
When I interact or talk with others while using ${q://QID23/ChoiceTextEntryValue/2} I feel like I am important. (4)	❍	❍	❍	❍	❍	❍	❍
When I interact or talk with others while using ${q://QID23/ChoiceTextEntryValue/2} I feel attached to them. (5)	❍	❍	❍	❍	❍	❍	❍

Q21 DEMOGRAPHICS: You're almost finished! This next section may require some help from your parent(s) to complete. Please have a parent/guardian help you with these last few questions.

Q22 What is your gender?

- ❍ Male (1)
- ❍ Female (2)

Q23 Please select your age range.

- ❍ 10-11 years old (1)
- ❍ 12-13 years old (2)
- ❍ 14-15 years old (3)
- ❍ 16-17 years old (4)

Q24 Please select your grade level.

- ❍ 3rd-5th Grade (1)
- ❍ 6th-8th Grade (2)
- ❍ 9th-12th Grade (3)

Q25 What city and state do you live in?

Q26 What is the highest level of school that your mother completed? (ONE ANSWER ONLY)

- ❍ a. Some high school or less (1)
- ❍ b. Finished high school (2)
- ❍ c. Some college or special school after high school (3)
- ❍ d. Finished college (4)
- ❍ e. School beyond college (like doctor, lawyer, professor, social worker, scientist) (5)

Q27 What is the highest level of school that your father completed? (ONE ANSWER ONLY)

- ❍ a. Some high school or less (1)
- ❍ b. Finished high school (2)
- ❍ c. Some college or special school after high school (3)
- ❍ d. Finished college (4)
- ❍ e. School beyond college (like doctor, lawyer, professor, social worker, scientist) (5)

Q28 What is your race or ethnic background? (ONE ANSWER ONLY)

- ❍ a. White (not Hispanic) (1)
- ❍ b. Black or African-American (not Hispanic) (2)
- ❍ c. Hispanic/Latino – White (3)
- ❍ d. Hispanic/Latino – Black (4)
- ❍ e. Asian, Asian Indian, or Pacific Islander (5)
- ❍ f. Native American or Alaskan Native (6)
- ❍ g. Some other race (7)

Q29 What is your family's annual income? (ONE ANSWER ONLY)

- ❍ a. $20,000 or below (1)
- ❍ b. $20,000-$50,000 (2)
- ❍ c. $50,000-$80,000 (3)
- ❍ d. $80,000-$100,000 (4)
- ❍ e. $100,000 or more (5)

Q30 What is the relationship your parents have with one another? (ONE ANSWER ONLY)

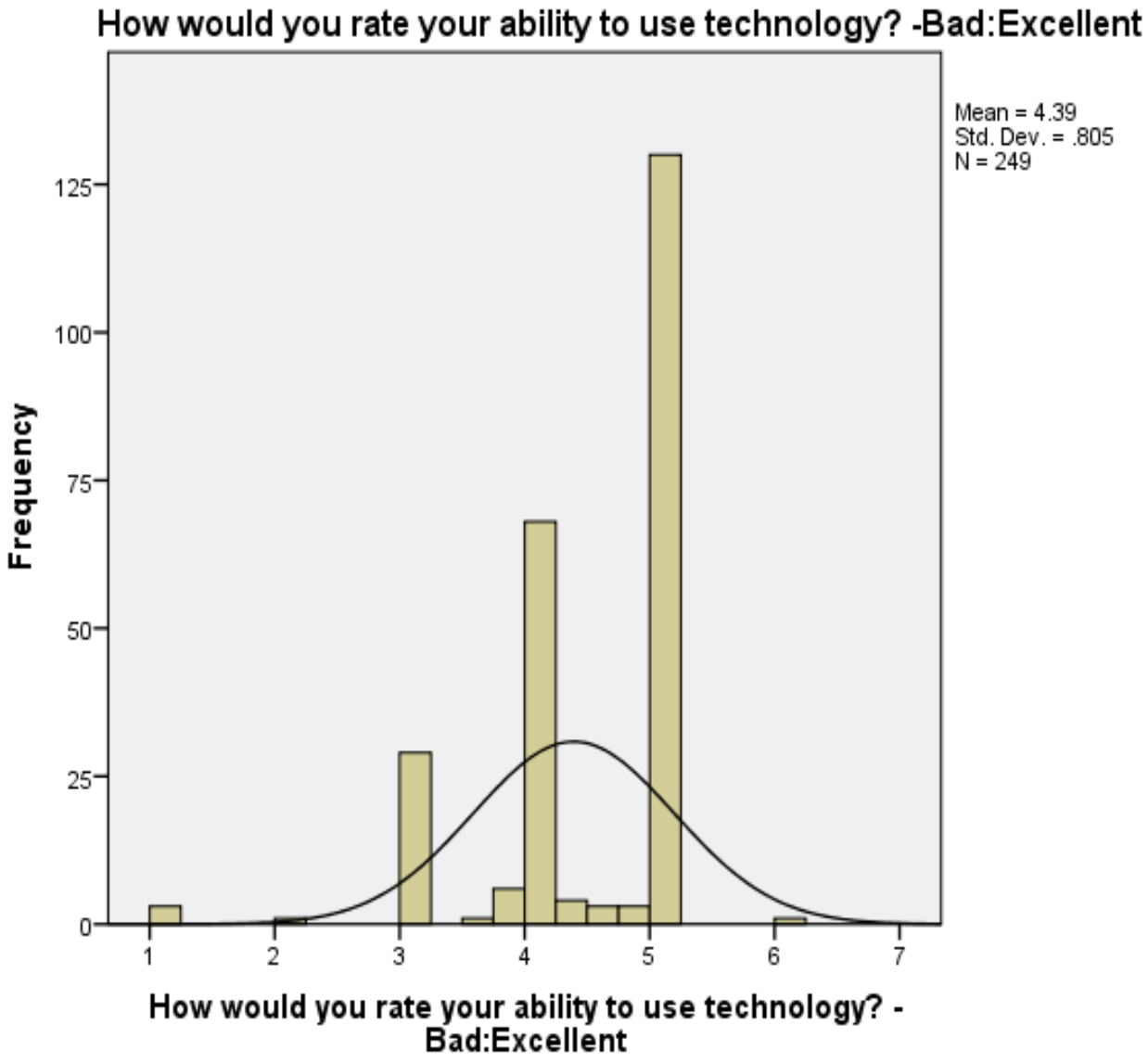
- ❍ a. Single (never married) (1)
- ❍ b. Separated (2)
- ❍ c. Divorced (3)
- ❍ d. Widowed (4)
- ❍ e. Married (5)

Q31 What is your current GPA (based on a 4 point scale)

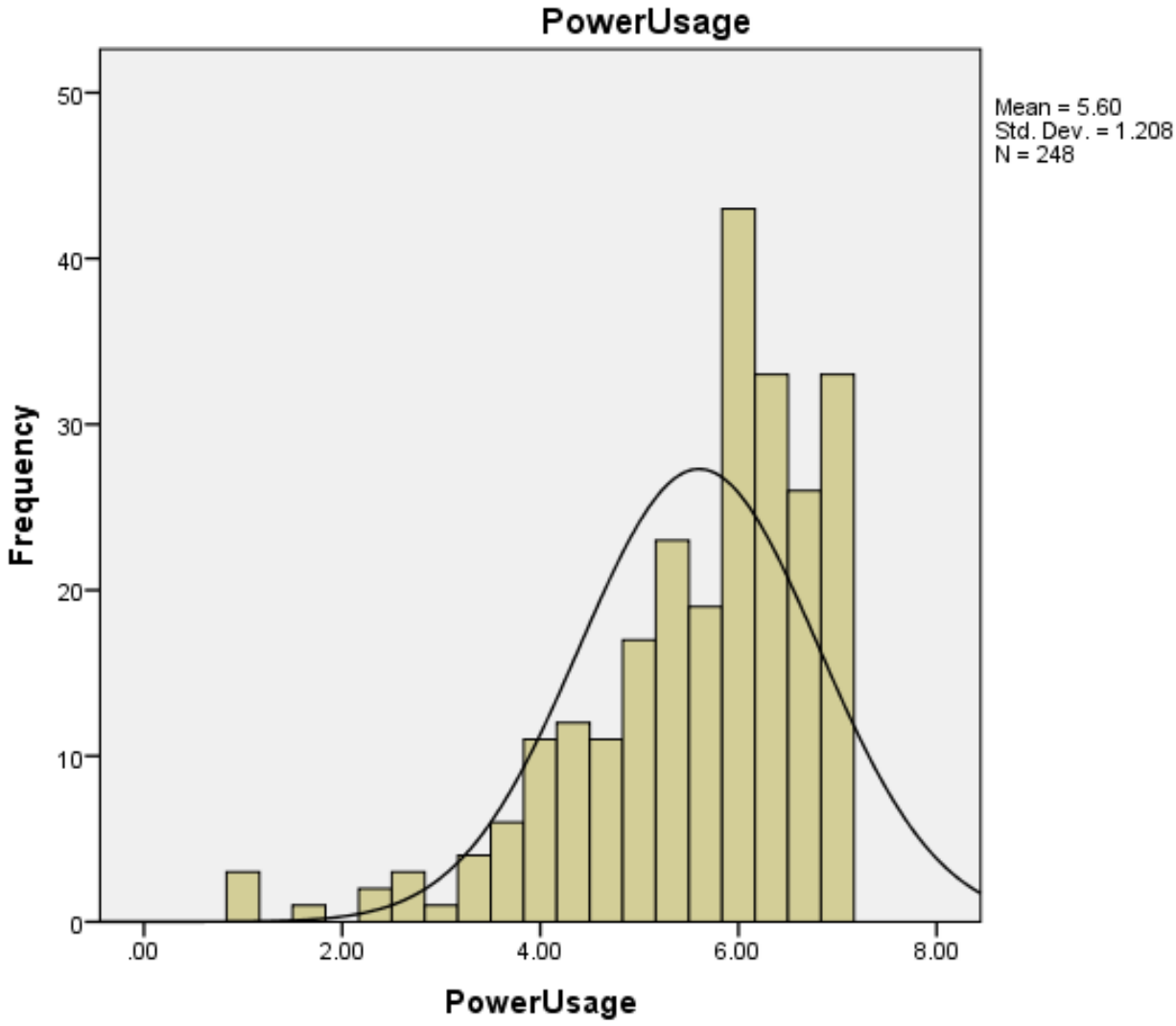
- ❍ Above 4.0 (1)
- ❍ 3.8-4.0 (2)
- ❍ 3.7-3.5 (3)
- ❍ 3.4-3.1 (4)
- ❍ 2.8-3.0 (5)
- ❍ 2.7-2.5 (6)
- ❍ 2.4-2.1 (7)
- ❍ 2.0-1.5 (8)
- ❍ 1.4-1.0 (9)
- ❍ Below 1.0 (10)

Q34 Thank you for completing the survey! If you wish to enter the raffle to win a prize, enter your email or a parent's email below.

Appendix B: Skewness & Kurtosis Technological Efficacy



Appendix C: Skewness & Kurtosis Power Usage



Appendix D: Full Model Results

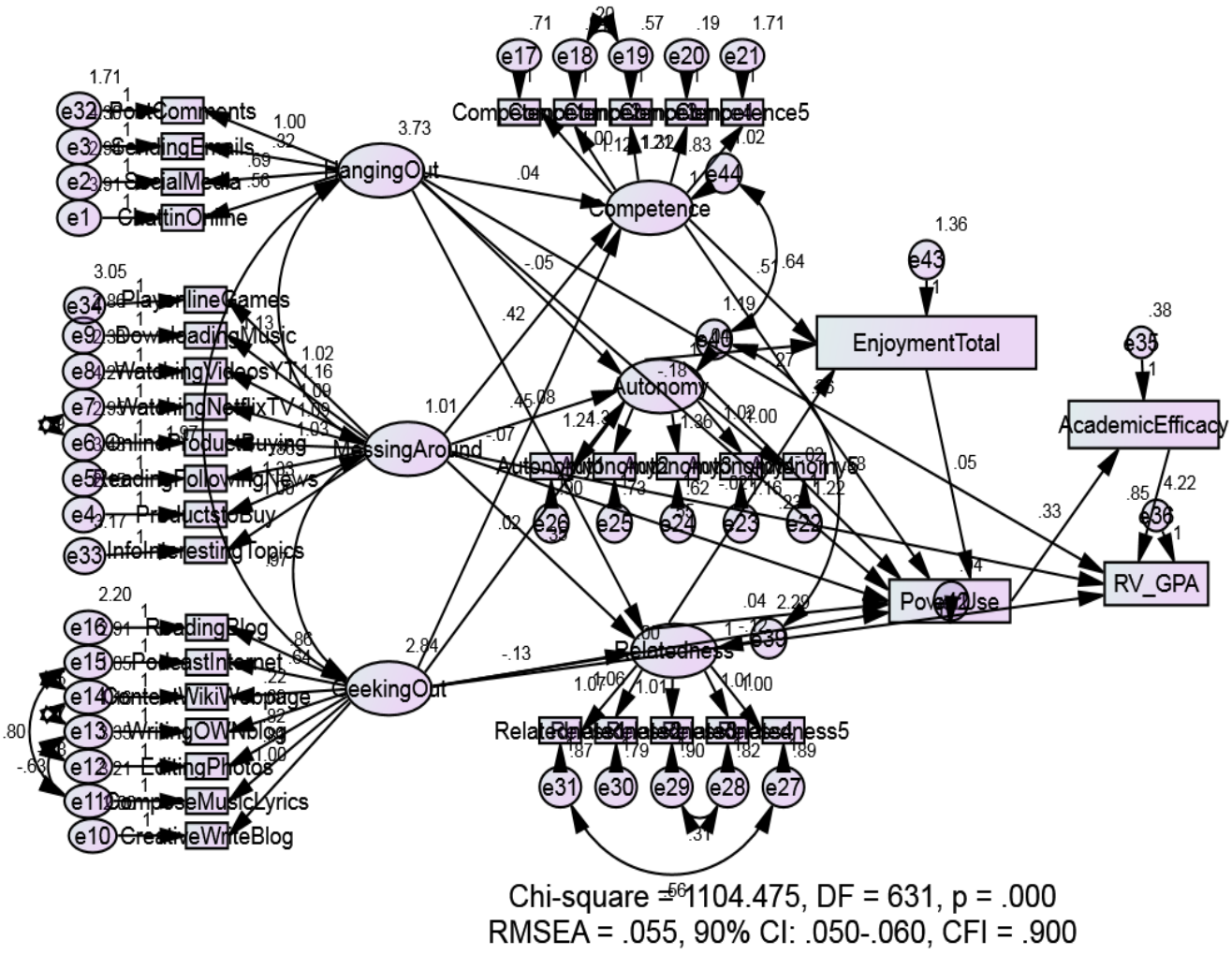


Figure 5. Results of proposed model with all variables. SEM output

References

Bentler, P. M. (1992). On the fit of models to covariances and methodology to the Bulletin. Psychological bulletin, 112(3), 400.

Blessing, R. H. (1995). An empirical correction for absorption anisotropy. Acta Crystallographica Section A: Foundations of Crystallography, 51(1), 33-38.

Bransford, J., Vye, N., Stevens, R., Kuhl, P., Schwartz, D., Bell, P. Sabelli, N. (2006). Learning theories and education: Toward a decade of synergy. In P. A. Alexander & P. H. Winne (Eds.), Handbook of educational psychology (2nd ed., pp. 209–244). Mahwah, NJ: Lawrence Elerbaum Associates.

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. Sage Focus Editions, 154, 136-136.

Byrne, B. M. (1994). Structural equation modeling with EQS and EQS/Windows: Basic concepts, applications, and programming. Sage.

Casner-Lotto, J., & Barrington, L. (2006). Are They Really Ready to Work? Employers' Perspectives on the Basic Knowledge and Applied Skills of New Entrants to the 21st Century US Workforce. Partnership for 21st Century Skills. 1 Massachusetts Avenue NW Suite 700, Washington, DC 20001.

Cheong, P. H. (2008). The young and techless? Investigating Internet use and problem-solving behaviors of young adults in Singapore. New Media & Society,10(5), 771-791.

Csikszentmihalyi, M. (1988). The future of flow. In M. Csikszentmihalyi & I. S.

Csikszentmihalyi (Eds.), Optimal experience: Psychological studies of flow in consciousness (pp. 364–383). New York: Cambridge University Press.

Cross, J. (2007). Informal learning: Rediscovering the natural pathways that inspire innovation and performance. San Francisco: Pfeiffer/Wiley.

Deci, E. L., & Ryan, R. M. (1985). Self-Determination. John Wiley & Sons, Inc..

Deci, E. L., & Ryan, R. M. (2000). The" what" and" why" of goal pursuits: Human needs and the self-determination of behavior. Psychological inquiry,11(4), 227-268.

Deci, E. L., & Ryan, R. M. (2005). Intrinsic motivation inventory (IMI). Retrieved July, 23, 2006.

Dede, C. (1995). Testimony to the US Congress, House of Representatives, Joint hearing on educational technology in the 21st century. Retrieved February 2, 2006, from http://www.virtual.gmu.edu/SS_research/cdpapers/congrpdf.htm

Eynon, R., & Malmberg, L.-E. (2011). A typology of young people's Internet use: Implications for education. Computers & Education, 56(3), 585-595. Elsevier Ltd. doi:10.1016/j.compedu.2010.09.020

Fang, X., Chan, S., Brzezinski, J., & Nair, C. (2010). Development of an instrument to measure enjoyment of computer game play. Intl. Journal of Human–Computer Interaction, 26(9), 868-886.

Ferguson, C. J. (2011). The influence of television and video game use on attention and school problems: A multivariate analysis with other risk factors controlled. Journal of psychiatric research, 45(6), 808-813.

Gagne, M., & Deci, E. (2005). Self-Determination Theory and Work Motivation. Journal of Organizational Behavior,, 26(4), 331-362.

Grodal, T. (2000). Video games and the pleasures of control.

Grolnick, Wendy S. (2002). "The development of self-determination in middle childhood and adolescence." in Development of achievement motivation. (0-12-750053-7, 978-0-12-750053-9), (p. 147)

Hastings, E. C., Karas, T. L., Winsler, A., Way, E., Madigan, A., & Tyler, S. (2009). Young children's video/computer game use: relations with school performance and behavior. *Issues in mental health nursing*, *30*(10), 638-649.

Ito, M. (2008). Participatory learning in a networked society: Lessons from the digital youth project.

Itō, M. (2009). Living and learning with new media: Summary of findings from the Digital Youth Project. MIT Press.

Ito, M. (2010b). Mobilizing the imagination in everyday play: The case of Japanese media mixes. Mashup Cultures, 79-97.

Ito, Mizuko, Kris Gutiérrez, Sonia Livingstone, Bill Penuel, Jean Rhodes, Katie Salen, Juliet Schor, Julian Sefton-Green, S. Craig Watkins. 2013. Connected Learning: An Agenda for Research and Design. Irvine, CA: Digital Media and Learning Research Hub.

Jackson, L. A., Von Eye, A., Biocca, F. A., Barbatsis, G., Zhao, Y., & Fitzgerald, H. E. (2006). Does home internet use influence the academic performance of low-income children?. *Developmental psychology*, *42*(3), 429.

Johnson, L., Adams Becker, S., Cummins, M., Estrada V., Freeman, A., and Ludgate, H. (2013). NMC Horizon Report: 2013 K-12 Edition. Austin, Texas:The New Media Consortium.

Johnson, D., & Gardner, J. (2010, November). Personality, motivation and video games. In Proceedings of the 22nd Conference of the Computer-Human Interaction Special Interest Group of Australia on Computer-Human Interaction(pp. 276-279). ACM.

Jones, A. C., Scanlon, E., & Clough, G. (2013). Mobile learning: two case studies of supporting inquiry learning in informal and semiformal settings. Computers & Education. 61: 21–32. Doi:10.1016/j.compedu.2012.08.008.

Katz, E., Blumler, J. G., & Gurevitch, M. (1974). The uses of mass communication. Current Perspectives on.

Kukulska-Hulme, A., Sharples, M., Milrad, M., Arnedillo-Sanchez, I., & Vavoula, G. (2009). Innovation in mobile learning: A European perspective. International Journal of Mobile and Blended Learning, 1(1), 13-35.

Marathe, S. S., Sundar, S. S., Bijvank, M. N., van Vugt, H., & Veldhuis, J. (2007). Who are these power users anyway? Building a psychological profile.Proc. International Communication Association.

Mallett, C., Kawabata, M., Newcombe, P., Otero-Forero, A., & Jackson, S. (2007). Sport motivation scale-6 (SMS-6): A revised six-factor sport motivation scale. Psychology of Sport and Exercise, 8(5), 600-614.

McAlearney, A. S., Schweikhart, S. B., & Medow, M. A. (2004). Doctors' experience with handheld computers in clinical practice: qualitative study. Bmj, 328(7449), 1162.

Midgley, C., Maehr, M. L., Hruda, L. Z., Anderman, E., Anderman, L., Freeman, K. E., ... & Urdan, T. (2000). Manual for the patterns of adaptive learning scales. Ann Arbor, 1001, 48109-1259.Nabi, R. L., & Krcmar, M. (2004). Conceptualizing media enjoyment as attitude: Implications for mass media effects research. Communication Theory, 14(4), 288-310.

Oliver, M. B., & Sanders, M. (2004). The appeal of horror and suspense. The horror film, 242-260.

Pachler, N., Bachmair, B., & Cook, J. (2010). Mobile devices as resources for learning: Adoption trends, characteristics, constraints and challenges. In N. Pachler, B. Bachmair, & J. Cook (Eds.), Mobile learning (pp. 73-93). Boston, MA: Springer US. doi:10.1007/978-1-4419-0585-7

Pea, R., Nass, C., Meheula, L., Rance, M., Kumar, A., Bamford, H., ... & Zhou, M. (2012). Media use, face-to-face communication, media multitasking, and social well-being among 8-to 12-year-old girls. Developmental psychology,48(2), 327.

Peng, W., Lin, J. H., Pfeiffer, K. A., & Winn, B. (2012). Need satisfaction supportive game features as motivational determinants: An experimental study of a self-determination theory guided exergame. Media Psychology, 15(2), 175-196.

Prensky, M. (2001). Digital natives, digital immigrants part 1. On the horizon,9(5), 1-6.

Przybylski, A. K., Weinstein, N., Murayama, K., Lynch, M. F., & Ryan, R. M. (2012). The Ideal Self at Play The Appeal of Video Games That Let You Be All You Can Be. Psychological science, 23(1), 69-76.

Reiss, S., & Wiltz, J. (2004). Why people watch reality TV. Media Psychology, 6(4), 363-378.

Rideout, V. J., Foehr, U. G., & Roberts, D. F. (2010). Generation M [superscript 2]: Media in the Lives of 8-to 18-Year-Olds. Henry J. Kaiser Family Foundation.

Rigby, S. (2004). Player Motivational Analysis: A model for applied research into the motivational dynamics of virtual worlds. Presented to the Motivation Research Group, University of Rochester, Rochester, NY.

Ryan, R. M., Kuhl, J., & Deci, E. L. (1997). Nature and autonomy: An organizational view of social and neurobiological aspects of self-regulation in behavior and development. Development and psychopathology, 9(04), 701-728.

Ryan, R. M., Rigby, C. S., & Przybylski, A. (2006). The motivational pull of video games: A self-determination theory approach. Motivation and emotion,30(4), 344-360

Sha, L., Looi, C. K., Chen, W., & Zhang, B. H. (2012). Understanding mobile learning from the perspective of self-regulated learning. Journal of Computer Assisted Learning, 28(4), 366-378.

Sharples, M., Arnedillo-Sanchez, I., Milrad, M., & Vavoula, G. (2009). Mobile learning: Small devices, big issues. In N. Balacheff, S. Ludvigsen, T. Jong, A. Lazonder, & S. Barnes (Eds.), Technology-enhanced learning (pp. 233-249). Dordrecht: Springer Netherlands. doi:10.1007/978-1-4020-9827-7

Sherry, J. L. (2004). Flow and media enjoyment. Communication Theory, 14(4), 328-347.

Shuler, C.(2012). iLearn II; An Analysis of the Education Category of the iTunes App Store. New York: The Joan Ganz Cooney Center at Sesame Workshop.

Sørebø, Ø., & Hæhre, R. (2012). Investigating Students' Perceived Discipline Relevance Subsequent to Playing Educational Computer Games: A Personal Interest and Self-Determination Theory Approach. Scandinavian Journal of Educational Research, 56(4), 345-362.

Sundar, S. S., & Marathe, S. S. (2010). Personalization versus customization: The importance of agency, privacy, and power usage. Human Communication Research, 36(3), 298-322.

Sweetser, P., & Wyeth, P. (2005). GameFlow: a model for evaluating player enjoyment in games. Computers in Entertainment (CIE), 3(3), 3-3.

Tamborini, R., Bowman, N. D., Eden, A., Grizzard, M., & Organ, A. (2010). Defining media enjoyment as the satisfaction of intrinsic needs. Journal of Communication, 60(4), 758-777.

Tremblay, M. A., Blanchard, C. M., Taylor, S., Pelletier, L. G., & Villeneuve, M. (2009). Work Extrinsic and Intrinsic Motivation Scale: Its value for organizational psychology research. Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement, 41(4), 213.

Warschauer, M., & Matuchniak, T. (2010). New technology and digital worlds:. (pp. 179-225).

Wong, L. H. (2012). A learner-centric view of mobile seamless learning. British Journal of Educational Technology, 43(1), E19-E23.

Yee, N. (2005, March 15). A model of player motivations. Retrieved October 3, 2006, from http://www.nickyee.com/daedalus/archives/001298.php?page=1

Zillmann, D., & Bryant, J. (1985). Affect, mood, and emotion as determinants of selective exposure. Selective exposure to communication, 157-190.

Zillmann, D., & Cantor, J. R. (1976). A disposition theory of humour and mirth.