THE RESEARCH PAPER IN THE DIGITAL AGE:
EDUCATING DIGITALLY LITERATE STUDENTS
IN THE ACADEMIC LIBRARY ENVIRONMENT

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ABSTRACT OF THE DISSERTATION

The Research Paper in the Digital Age:
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The academic research paper as a mini-research article has had tremendous benefits in teaching students how to prepare work in a model that met the standards of scholars and the requirements for business. The research paper has long roots and an established history going back over a century as a mechanism to summarize knowledge, similar to the journal article that it emulated.

Today's journal literature has a growing graphic and digital presence. Some medical journals now exist solely in video format. It is possible that student work may follow a similar trajectory. That research paper is now in the process of undergoing major changes as the text-based world rapidly transforms into a digital landscape.

The primary goal of the proposed study is to map past and current practices with likely futures moving from traditional research papers to digital products. This exploratory study used an online survey and personal interviews in a study involving three groups of individuals—professors, librarians, and teaching assistants—from four

academic subject areas—humanities, social sciences, sciences, and professional schools. The survey sample included 148 participants and the in-depth interview sample consisted of 16 volunteers. The sample included professors who had published in peer-reviewed video journals.

Analyses of responses have revealed that position, academic area, age, and technology use of respondents are indicators of acceptance of new digital multimedia formats and how these might define an educated person in today's society. Models include all cases followed by analyses of the sub-groups. This study used a mixture of exploratory quantitative and qualitative data analyses to suggest hypotheses for later investigations.

This project is significant because it looks at the changes to research papers in academia and what it means to be an educated person in a multimedia digital environment. Such an understanding would assist in educating library and information professionals and in serving undergraduate students as the definition of an educated person continues to evolve. It is hoped that 'educated' students will have a beneficial impact on society through communication of knowledge as it progress toward a dynamic multimedia digital environment.

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DEDICATION

To my Heavenly Father

To my parents, SamSoo Kim and HeeJa Yoon

To my son, Da'El Kim

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CHAPTER 1: INTRODUCTION

What Does It Mean to Be An Educated Person?

The former president of Harvard University, Derek Bok (2006), stated that many students are now being graduated from college "without being able to write well enough to satisfy their employers… reason clearly or perform competently in analyzing complex, non-technical problems" (p. 8). The quality of undergraduate education in this country is being scrutinized not only by educators, but also by policy makers, practitioners, the public, and stakeholders in the higher education system who have increasingly come to raise similar questions about the very meaning of being a college graduate (Arum & Roksa, 2011). Two core issues emerge when these topics are addressed: competency in the workplace, and competence in contributing to society as an educated individual.

Does the content of higher education stay parallel to the needs of society? In 2010, Ali and Katz created two surveys to assess perceived assessments of students' information and communication technology (ICT) literacy skills by human resources (HR) consultants and business school faculty. The results of the study showed differing expectations for students' ICT literacy skills between these two groups. Ali and Katz (2010) noted that "employers seek ICT-literate workers, yet business schools might not be teaching these skills." (p. 17). They also commented that "business school faculty involvement is critical to any initiative for curricular change because faculty hold a key position as a link among the various stakeholders: school administrators, employers, and students. Faculty should work closely with library staff, who traditionally have been the primary instructors of information literacy and ICT literacy skills, to develop course

activities and assignments that provide critical ICT literacy training." (Ali & Katz, 2010, p. 17). Other researchers also criticized business schools' as not preparing their students for the workplace (Abraham & Karns, 2009; Pfeffer & Fong, 2002; Syed, Mingers, & Murray, 2010). According to Arum and Roksa (2011), "business leaders have begun to ask whether graduates have acquired the necessary skills to ensure economic competitiveness." (p. 1).

Meanwhile, "… educators within the system itself have begun to raise their voices questioning whether organizational changes to colleges and universities in recent decades have undermined the core educational functions of these institutions" (Arum & Roksa, 2011, p. 1). Almost 80 years ago, Hutchins (1936b), who created a radically different curricular model for The University of Chicago, stated that "learning at the college level should have no vocational aim. It should provide a common stock of fundamental ideas." (p. 116). He said "one purpose of education is to draw out the elements of our common human nature" (Hutchins, 1936b) where "wisdom and goodness are the aim of higher education" (Hutchins, 1943). There are mixed reviews about "whether students are actually developing the capacity for critical thinking and complex reasoning at college. In a rapidly changing economy and society, there is widespread agreement that these individual capacities are the foundation for effective democratic citizenship and economic productivity." (Arum & Roksa, 2011, pp. 1-2). In this regard, Bok (2006) described that "with all the controversy over the college curriculum… it is impressive to find faculty members agreeing almost unanimously that teaching students to think critically is the principal aim of undergraduate education" (p. 109).

Then, what does it mean to be an educated person? What do professors require as essential components of their courses to educate a person who will be considered "educated"? Hodgson (2010) discussed this question and responded by asking "how the value of being an educated person is currently understood, and further, how it might be understood differently" (p. 109). Today, there might not be universal explanatory definitions of what constitutes an educated person. Boyer (2009) stated that in order to answer to this question, it should consider "not the curriculum, but the human condition." He suggested the curriculum might be organized on the basis of "core commonalities." He explained this by adding the importance of "universal experiences that make us human, experiences shared by all cultures on the planet" (Boyer, 2009). The eight commonalities that Boyer (2009) envisions are: 1) the life cycle, 2) language, 3) the arts, 4) time and space, 5) groups and institutions, 6) work, 7) natural world, and 8) search for meaning. With these commonalities, Boyer (2009) finally concluded, "above all, being an educated person means being guided by values and beliefs and connecting the lessons of the classroom to the realities of life. … I realize that remarkable changes must occur for this shift in goals to take place, but I hope deeply that in the century ahead students will be judged not by their performance on a single test but by the quality of their lives. It is my hope that students in the classrooms of tomorrow will be encouraged to create more than conform, and to cooperate more than compete."

There appears to be a tension between a notion of universal core commonalities and the immediate needs of a society to have a competent workforce. Further reflection of the time we live in would need to add the value of being an educated person in a digital age. Bacow, Bowen, Guthrie, Lack, and Long (2012) reported that most colleges

and universities provide distance education via online courses to better serve students' needs rather than to save on costs. They comment that "digital technology has already changed the way colleges and universities function, but no matter how significant those changes feel today, real transformation is just beginning. Every day, a new program in online learning is announced, and on the horizon is the promise of using new adaptive learning technologies … to educate more students than ever before at lower cost and with similar or even better learning outcomes" (Bacow, Bowen, Guthrie, Lack, & Long, 2012, p.2). As this digital age began to take root, the Association of College and Research Libraries (2000) pointed out that information literacy is a key component of lifelong learning and an important goal of higher education (p. 4):

> Developing lifelong learners is central to the mission of higher education institutions. By ensuring that individuals have the intellectual abilities of reasoning and critical thinking, and by helping them construct a framework for learning how to learn, colleges and universities provide the foundation for continued growth throughout their careers, as well as in their roles as informed citizens and members of communities. Information literacy is a key component of, and contributor to, lifelong learning. Information literacy competency extends learning beyond formal classroom settings and provides practice with self-directed investigations as individuals move into internships, first professional positions, and increasing responsibilities in all arenas of life. Because information literacy augments students' competency with evaluating, managing, and using information, it is now considered by several regional and discipline-based accreditation associations as a key outcome for college students.

In a 2013 Ithaka S+R library survey of U.S. academic library directors the statement receiving the highest agreement (97%) as very important to all types of institutions was "helping undergraduates 'develop research, critical analysis, and information literacy skills'" (Long & Schonfeld, 2014, p. 14). It can be assumed that this

activity represents a core mission of US academic libraries. It was not stated how this goal was assessed for its impact.

Again, perhaps there is no universal, explanatory definition of what constitutes an educated person today. However, one point that merits consideration may be "the connectedness of things" as Mark Van Doren (1943) wrote over 70 years ago, "the connectedness of things is what the educator contemplates to the limit of his capacity" (p. 115). He concluded by saying that a "the student who can begin early in life to see things as connected has begun the life of learning" (Van Dore, 1943, p. 115). Hutchins (1936a) also stated that "the aim of education is to connect man with man, to connect the present with the past, and to advance the thinking of the race." (p. 131). Perhaps, it seems that one of the answers of what does it mean to be an educated person is all about connections.

Statement of the Problem

It is interesting to consider how something so common as the research paper emerged as a vehicle to communicate how students understood knowledge and how they were able to contribute to it. It is even more fascinating to speculate if the research paper can survive in a digital, multimedia era. In the area of student learning, there have been three primary ways to represent students' understanding of independent research. They are test, research paper, and presentation. The academic research paper has been perceived as a microcosm of journal articles and book chapters in order to benefit students who prepare work in a model that met the standards of scholars. The research paper has long roots and a history going back over a century, but now it is in the process

of undergoing major changes as the text-based world rapidly transforms into a digital landscape as it is estimated that most of the world's information is now digital.

New and emerging information and communication technologies are having a profound impact on how students access, use, communicate, and share information. The trend toward using digital information is affecting the way we live, learn, work, play, and interact socially. In particular, videos and still photographs for scholarly communication in science or medical journals are increasingly used as supplementary data to support work that cannot be communicated by published text. Dissertations are now embedding video making such work not reducible to text.

It is expected that college students' research paper requirements may soon follow such journal article examples because, in times past, research papers had been a student simulation of journal articles or book chapters or corporate reports. Today's journal literature has a growing graphic and digital presence with text supplemented by web based data and displays. A look at new journal articles being produced reveals two interesting aspects: (1) science journals now go beyond text to present complex images, charts, graphs, and data on supplementary web sites to show microscopic data, video, and other media products; and, (2) there are now video journals in the medical area. These represent a new and vibrant model for the research paper of the past as it evolves and morphs into a digital, electronic, or multimedia form.

It was recognized some years ago that the research papers using multimedia products can become the general or formal research term project of future colleges or universities (Mitchell, 2005). In recent years, PowerPoint and equivalent presentation

mechanisms exist as outputs to represent students' research processes. PowerPoint is joined by such products as Keynote, Prezi, Haiku Deck, and SlideShare (Clarke, 2013). It is also likely that the research paper served as a model for the corporate report which is also undergoing change as PowerPoint and similar display mechanisms replace text based papers.

This study aims to explore how and why professors, librarians, and teaching assistants perceive and evaluate the research papers in any format over time. The primary goal of the proposed study is to map past and current practices with likely futures moving from traditional research papers to digital products. This is an exploratory study to examine professors', librarians', and teaching assistants' perception and evaluation in changes to research papers according to the passing of time: 1) what their experience was with research papers when they were undergraduate students; 2) what changes have occurred in the past five years; 3) what their current practices are with research papers or equivalent requirements; and, 4) what changes might be expected in the next five years.

Research Significance

This project is significant because it looks at the changes of research papers in academia. This pointed to the products being produced by undergraduate students which often included PowerPoint presentations or other digital presentation tools. Such efforts are not microcosms of research reports (for example, journal articles) as research papers had been. If the purpose of higher education is to prepare informed citizens then the new research paper model may need to create meaningful summaries of scholarly work in a

digital environment similar to the multimedia science journals. Such an understanding would assist in educating library and information professionals and in serving undergraduate students. It may also address part of a larger issue identifying what it means to be an educated person in our society.

Literature reviews have indicated that research papers emerged as summary documents similar to journal articles. As noted above, many journals now incorporate digital formats even to the point of requiring video presentations or documentation. It is expected that research papers may be changing to emulate journal articles and this knowledge would be of benefit to a larger academic community. Traditional research papers may have their place in some disciplines but be less evident in other subject areas (e.g., humanities vs science). This study employs a mixture of exploratory quantitative and qualitative data analyses to suggest hypotheses for later investigations.

CHAPTER 2: LITERATURE REVIEW

Journals and Research Papers

History of Journals

Many early journals were involved in scientific societies and organizations (Hessenbruch, 2000). According to Kronick (1961), the origin of scientific and technical journals dates from 1665. He traced the history of journals from the French *Journal des sçavans* and the English *Philosophical Transactions of the Royal Society* when they first published research results periodically in the 17th century. Hessenbruch (2000) stated that "the journal evolved not only as a form of communication, but also as the centre of a system of quality control based on what is now called peer review" (p. 390). Editorial and refereeing practices have been gradually developed to provide appropriate and accurate material to the readership (Hessenbruch, 2000). Hessenbruch (2000) described that "the scientific journal was not born fully formed, but instead evolved from private and informal literary communications, and only gradually acquired modern forms of editorial and quality control" (p. 390). Although the peer-review system became common for science funding allocations in the 20th century, the current peer-review already evolved from the 18th century (Benos et al., 2007).

In the 18th century, over a thousand journals were published and since then the number has increased by geometric progression (Kronick, 1976). However, many earlier publishing efforts have since failed. Meanwhile, such established journals as *Science* and *Nature* have survived and benefited from reliance on web-based documentation.

In the 19th century, many journals were published on a weekly basis. Among them, *Nature* was the most successful weekly publication and became a prime model of commercial journal publishing (Hessenbruch, 2000). It spans more than fourteen decades—the first issue of the journal *Nature* was published in 4th November 1869 (Nature Publishing Group, 2014a). According to the 2012 *Journal Citation Reports Science Edition*, *Nature* is the most highly cited science journal (Thomson Reuters, 2013). It has been continuously published on a weekly basis and is one of the most prestigious international and interdisciplinary journals in all fields of science and technology. Now *Nature* has encouraged researchers to include multimedia services using the internet, a Podcast, and video journal articles.

In the 20th century, scientific works continued to accelerate in number and variety resulting in a marked growth of periodical publications. Journals are often considered significant "as publishers of record, and as systems of quality control"; yet scientists have also depended on immediate and informal communication (Hessenbruch, 2000, p. 390). In the middle of the 1990s, the increased popularity of the Internet brought new media platforms and opportunities to experiment in various interdisciplinary areas. Electronic journals started to be accessed via electronic transmission. Defelice (2006) noted that "scholarly electronic journals are different from print journals in form and access mode, and vary far more than print journals. However, the role of the scholarly journal has not changed with the form. User requirements for ease of access and reliability of content are still important considerations." In this connection, since the late 20th century, researchers have become accustomed to accessing a large variety of electronic journals. Many journals quickly evolved to be published in electronic format, usually on the Internet. The

electronic journals were, at first, 1) online versions of printed journals, but it was soon realized that 2) value-added components could be embedded in the online product. Hot links to other sources from the journal article and its references became an area of attention as the online journal quickly evolved. That evolution now includes the embedding of multimedia images and video within the article or appended to it.

With the growth of electronic journals, university libraries have rapidly moved toward electronic journal collections (King, Tenopir, Montgomery, & Aerni, 2003). Over several decades, the transition from print journals to electronic journal collections exerted an effect on information seeking and reading patterns of faculty members, particularly among science faculty (King, Tenopir, Montgomery, & Aerni, 2003; Tenopir, King, Edwards, & Wu, 2009). The research showed that "the average number of readings per year per science faculty member continues to increase, while the average time spent per reading is decreasing" (Tenopir et al., 2009, p. 5). King et al. (2003) reported "scientists appear to be more advanced in their use of electronic journals than other faculty, but changes are taking place within all faculty disciplines." Due to its convenience and time savings, electronic journal use has greatly increased, especially when available in library collection (King et. al., 2003). Patterns in the use of technologies by faculty are undergoing small but gradual changes as documented by an Ithaka study of 5,261 respondents: "Small but non-trivial shares of respondents use technology in their undergraduate teaching. But while most recognize the availability of resources to help them do so, many respondents do not draw upon resources beyond their own ideas or feel strongly motivated to seek out opportunities to use more technology in their teaching" (Housewright, Schonfeld, & Wulfson, 2013, p. 6).

In the late 20th century, open access journals and repositories also offered "a public place where scholars and researchers can make their work available at any point in its development process" (Weinberger, 2011, p. 183). There has been an issue of abundance of information. But, the matter of information overload problems might be resolved by creating "more information: metadata" (Weinberger, 2011, p. 185). Weinberger stated "providing metadata for what you post in the new public of the Net enables it to be found more easily" (Weinberger, 2011, p. 185).

In this 21st century, many more journals now incorporate various digital formats even to the point of requiring image or video components. In the new millennium, the journal *Nature* started to provide the Nature Podcast service and produced internet video pieces and other web innovations to accompany major papers. Nature Publishing Group (2014b) stated that "The Nature video archive now features many scientists describing their work in their own words, from the discovery of juvenile hominid remains, Pluto's moons, to the development of brain–machine interfaces for paraplegics." Likewise, science or medical journals are increasingly used as supplementary data to support work that cannot be communicated by published text. This phenomenon reflects a new mode of scholarly communication for academic work, and it is beginning to embody the dynamic environment that might link the scholarly presentation at a conference to the academic journal article providing more substantive evidence of research findings. Today's journals keep expanding their media landscape and, in particular, their work is transformed to formats for digitally literate people in this digital age.

History of Research-Based Term Papers

The phrases ‘term paper’ and ‘research paper’ have often been used interchangeably in colleges and universities. But, not all term papers involve academic research and also not all research papers are term papers. According to Oxford English Dictionary Online, a ‘term paper’ is “an essay or dissertation representative of the work done during a single term.” Term papers are ordinarily intended to describe a concept or topic, make observation or evaluation, analyze a perspective, organize ideas, or argue a point. They are often due at the end of a term—semester or quarter. That is why it is usually referred to as a term paper. At this point, research means “a systematic process of investigating a topic and its context by strategically gathering data and analyzing them, and then sharing findings and recommendations. Research can be considered as an extension of problem-solving.” (Farmer & Stricevic, 2011, p. 8).

For this investigation, a research paper means a ‘research-based term paper’ which is a thesis driven original work on a particular subject. The reading materials may come from several academic sources. We will assume that an academic journal article is a prototype of the research term papers and that college research papers have been perceived as microcosms of such things as journal articles, book chapters, dissertations, or documented technical reports. Such work can be a tool for developing critical thinking skills.

The idea of research papers can be traced to the 19th century. Prior to the 1870s, there were few references to writing, but it appeared that composing was the copying of the teacher’s or another expert’s writing (Burrows, 1977). Brereton (1995) wrote that “classes were conducted by the recitation method, with students mastering a text for

homework and reciting it" (p. 3). Composing by itself was not seen as a necessity and not taught directly, but it was mostly regarded as derivative for oral recitation (Moulton & Holmes, 2003; Russell, 1991). However in 1876, the course of American education changed following the German model which was more tightly focused on the creation of new knowledge (Moulton & Holmes, 2003). German students conducted research based on their studies and submitted written reports rather than focusing on oration, memorization, or presenting recitations (Russell, 1991). Since then, following the learning/ research/ writing model of the Germans, a research-based term paper came to America. During the thirty years from 1870 to 1900, American education was reconstructed as "writing became the method of discourse and research the hallmark of learning" (Moulton & Homes, 2003, p. 365). Finally by 1910, the research term paper developed its familiar form (Russell, 1991). A problem of plagiarism and the sale of the research term paper also emerged (Russell, 1991), but as the end-of-term-assessment, the research term papers became a preferred and frequently used method in higher education. In scientific and technical areas there was an equal emphasis for students in laboratory classes to produce reports based on their experiments.

In the new millennium, research term papers increasingly ask for digital literacy skills in today's students (Whitley-Grassi & Hoefler, 2012). In this study, a 'digital research paper' is defined as a product that goes beyond traditional text or text with graphic images on paper to include new digital formats such as video, sound, and other digital presentation methods available through websites or embedded in presentation tools such as PowerPoint.

Video Journals in the Digital Age

The advent of digital technology brought about changes in the way people learn, present, and share knowledge. In particular, videos have opened up new possibilities regarding knowledge sharing on the Web. This may be due to the immediacy of visual information as a notably efficient method of communicating knowledge. It is dominant when the perceptual power of the image appears together with the written or oral forms of language (Barry, 1997), since "the part of the brain devoted to processing and analyzing input from the eyes is larger than the parts devoted to processing the input from any other sense" (Pasquali, 2007, p. 712). Reading text does involve the visual senses but multimedia may also include aural senses. Examining bacteria moving on a microscopic slide may inform the observer with more information than a still image or reading text about such motion. Due to such fundamental attributes of visual information, using video for communicating information can give benefits beyond those offered by reading text.

Pasquali (2007) described the possible advantages when scientists use new technologies, especially video to communicate scientific methods, protocols, and results instead of traditional verbal descriptions. The use of video can highlight aspects of science as it produces an exact replication of the evidence used to support a research decision. It transmits the diverse details of a new protocol or explains complex technical laboratory work with the honesty and integrity of the author (Pasquali, 2007). The reliability of the video recording makes scholarly knowledge communication a more accurate and powerful way to convey a finding, especially in the sciences and technology. It is expected that this is also extendable to the social sciences and humanities to present its evidence at a primary level.

There is an expanding literature that videos are efficiently used by academics for teaching and learning (Bryan & Recesso, 2006; Friel & Carboni, 2000; Hattie, 2009; Picci, Calvani & Bonaiuti, 2012; Rich & Hannafin, 2009; Santagata & Guarino, 2010; Seago, 2004; Sherin, 2004; So, Pow & Hung, 2009; Ullrich, Shen, Tong & Tan, 2010). Nonetheless, video also improves scholarly communication as noted earlier with videos increasingly including supplementary data to support work that cannot be communicated by nor rely solely on published text (Kousha, Thewall, & Abdoli, 2012). Indeed, even in the early twentieth century during the technological development of film, scientists and anthropologists began using 'moving images' to record their work and added an important component to data collection with this methodology (Mead, 1963; Pasquali, 2007).

Journals such as *Nature*, the *Journal of Visualized Experiments (JoVE)*, and the *Video Journal and Encyclopedia of GI Endoscopy* now go beyond text to present complex research processes with videos and publish them on their public websites. As noted, the journal *Nature* publishes submissions through its online site while open access journals have adopted similar practices and grown expeditiously in stature and importance (Weinberger, 2011).

JoVE was found to be the first video-based scientific journal as continues to grow as a prestigious journal in science. *JoVE* is "a peer reviewed, PubMed indexed journal devoted to the publication of biological, medical, chemical and physical research in a video format" and its mission is "to increase the productivity of scientific research" (JoVE, 2013). It states that the "written word and static picture-based traditional print journals are no longer sufficient to accurately transmit the intricacies of modern research,"

and *JoVE* asks that each published manuscript be accompanied by a video film recorded in the author's own laboratory (JoVE, 2013). The video film can be produced by the author or by *JoVE'*s professional team of science and video editors. Such frontier video journals that allow for the direct visualization of various experiments, overcome "the inherent limitations of traditional, static print journals thereby adding an entirely new parameter to the communication of experimental data and research results" (JoVE, 2013).

Video Journal and Encyclopedia of GI Endoscopy, published by Elsevier, is a peer-reviewed and open access video journal available both online and with mobile devices (Video Journal and Encyclopedia of GI Endoscopy, 2016a). The first volume of the journal was started in 2013 and two volumes have been completed since then. The unique format of this journal provides two elements: 1) an expert video encyclopedia, and 2) a scientific video journal. The aims of scope of the *Video Journal and Encyclopedia of GI Endoscopy* describes:

> Modern endoscopic imaging offers a plethora of detailed visual information and [sic] endoscopic procedures are becoming increasingly sophisticated and complex. Therefore endoscopists need a new appropriate tool for visual transmission of proceedings in endoscopy. The innovative Video Journal and Encyclopedia of GI Endoscopy takes these developments into account and aims to be the premium and first choice international reference for endoscopic findings and procedures. The focus on high-quality video demonstrations of endoscopic findings and procedures offers a completely new way of presenting the work of GI experts and allows for easy comprehension of information. (Video Journal and Encyclopedia of GI Endoscopy, 2016a)

The editorial board of this video journal is international: USA, UK, France, Germany, Belgium, Netherlands, Switzerland, Poland, Norway, Japan, Australia,

Portugal, and Chile. Some of the complete expert encyclopedia and selected videos from this video journal are also available on YouTube channel.

Indeed, video journal articles by *Nature*, *JoVE*, or the *Video Journal and Encyclopedia of GI Endoscopy* have been increasing in use by science or medical researchers. Recent examples of video journal articles are films of a study of video game training for enhancing cognitive control in older adults as reported by *Nature* (Anguera et al., 2013), initiating differentiation in immortalized multipotent otic progenitor cells by *JoVE* (Azadeh et al., 2016), and pancreatic necrosectomy through a novel double-flange lumen-apposing covered metal stent (video) by the *Video Journal and Encyclopedia of GI Endoscopy* (Sanchez-Yague, A., 2014).

Yet in order to view most *Nature* and *JoVE* articles, a subscription is required similar to gaining access to many academic journals. However, the *Video Journal and Encyclopedia of GI Endoscopy* is an open access journal that is "immediately and permanently free for everyone to read, download, copy and distribute." Although there are "no subscription charges, a fee is payable by the author or research funder to cover the costs associated with publication" (Video Journal and Encyclopedia of GI Endoscopy, 2016b). Authors of the video journal articles will hold their copyright with scholarly usage rights, and the publisher Elsevier is granted the rights of publishing and distribution of the video journal (Video Journal and Encyclopedia of GI Endoscopy, 2016b). Rapid knowledge transfer through video technology can increase dissemination of research results while improving the productivity of researchers. This can benefit both the research community and the general public since videos can capture and transmit the complexity

of life science research and it may also lift the laboratory time sink which consumes significant time.

The PowerPoint Presentation

There is a Chinese proverb, “tell me and I’ll forget; show me and I may remember; involve me and I’ll understand.” Nowadays, PowerPoint has been used as one of the main methods to present students’ understanding of independent research. Further, the use of PowerPoint is so widespread not only in higher education but also in business presentations. It is regarded as an effective presentation technique for telling, showing, involving people with a presented topic. The PowerPoint presentation has been used not only for presenting research works but also for communicating effectively with audiences with visual aids. Collins (2004) described the PowerPoint presentation as “techniques to encourage audience participation include questioning, brainstorming, small-group activities, role-playing, case-based examples, and directed listening. It is first necessary to motivate and gain attention of the learner for learning to take place.” (p. 1185). Even in 2001, Parker stated that to “appear at a meeting without PowerPoint would be unwelcome and vaguely pretentious, like wearing no shoes” (p. 2).

Given the widespread adoption of PowerPoint and its effectiveness, there are also conflicting accounts about the effectiveness of PowerPoint on student performance in higher education although these are the smaller number of authoritative studies. Rankin and Hoaas (2001) reported that there is no significant benefit of PowerPoint presentations on student grades. It indicated that teaching with PowerPoint did not lead to significantly

better student performance than by teaching with more conventional methods. Contrary to this, Lowry (1999) reported that classes with PowerPoint lecturing "achieved better grades than the traditional-lecture cohort […] and students exposed to PowerPoint lecturing had a positive attitude towards the method" (pp. 20-21).

From a different standpoint, Szabo and Hastings (2000) found that over 90% of students said that PowerPoint "is more attention capturing than the traditional method of lecturing," and 85% found that "PowerPoint lectures are more interesting than traditional lectures" (p. 179). But, this early study did not show that better academic performance accompanied students' preference for PowerPoint lectures. At least in some circumstances, PowerPoint lectures have entertainment features that may enhance student preferences but might not prove to provide additional educational benefits over more traditional lecturing methods.

Using research that is now dated, Bartsch and Cobern (2003) provided a review of the empirical evidence (p. 78) underlying the effectiveness of PowerPoint and computer presentation:

> Overall research indicates that students prefer PowerPoint type presentations from transparencies (Cassady, 1998; Perry & Perry, 1998; Susskind & Gurien, 1999; West, 1997). Unfortunately, information on whether computer presentations improve student performance is much less clear. Several studies point to the idea that graphics improve student recall (ChanLin, 1998; 2000; Lowry, 1999; Szabo & Hastings, 2000, Exp. 2). However, many courses that adopted multimedia presentations have not shown a corresponding increase in student performance (Stoloff, 1995; Susskind & Gurien, 1999; Szabo & Hastings, 2000. Exp.1 and 3; West, 1997). In fact, one study demonstrated a decrease in student performance when the instructor switched from transparencies to PowerPoint (Bartlett, Cheng, & Strong, 2000).

However, these older studies may not be generalized to the challenges now confronting digitally literate students today. Although PowerPoint has a debatable reputation with limited empirical evidence on whether or not it is effective in enhancing students' learning, Craig and Amernic (2006) argued that "PowerPoint should be recognized as a new communication medium that is fundamentally changing the nature and dynamic of *how* we teach." (p. 156). Furthermore "a major challenge facing educators will be to convert the generally positive disposition of students to PowerPoint into significantly better learning and performance" (Craig & Amernic, 2006, p. 151).

But beyond all descriptions about PowerPoint's effectiveness, it is important to note that contemporary college classrooms have continued to offer new media for instructional technology use (Parker, Bianchi, & Cheah, 2008). For instance, PowerPoint or Prezi are presented rather than overhead transparencies, and whiteboards or smart boards are used instead of chalkboards, and, moreover, electronic communications via emails, virtual online chats, WebCT or Blackboard have become common for teaching and learning. But here what is most important to recognize is that this represents a fluid and changing environment for the use of instructional technology in higher education institutions. Thus, the mediums of instructional technologies as well as their conveyance of the contents of the academic curriculum merit special attention when examining experiences and preferences of professors, librarians, and teaching assistants in this digital age.

Multimedia Digital Research Papers in the Digital Age

In the academic library environment, students learn multiple ways to communicate to others through their research papers. Yet, producing multimedia digital research papers might better and more fully convey what words alone might accomplish. Several researchers have already noted that the form of the research term papers will get replaced by digital, electronic, or multimedia forms in the digital age (Mitchell, 2005; Olinzock & Okojie, 2006). In other words, research term papers using multimedia products can become the general or formal research term paper of future college or university students (Mitchell, 2005).

In recent years there has been a noticeable shift from the use of a paper-based portfolio to an electronic portfolio (also known as ePortfolio) in educational and professional learning contexts (Avraamidou & Zembal-Saul, 2006; van Wesel & Prop 2008a; 2008b). Portfolio-based learning has been increasingly implemented for monitoring students' professional development worldwide—especially in medical education and related health fields (Challis, 1999; Prop, Shacklady, Dornan, & Driessen, 2007; van Wesel & Prop, 2008b). The term 'portfolio' is used as a collection of students' work and achievements during their academic career (Challis, 1999; Chen, Yu, & Chang, 2007). Most paper-based portfolios are produced in a word-processing application with original attachments in printed format, but an electronic portfolio is a website portfolio with attachments in digital format; it is also called a Web-based portfolio (van Wesel & Prop, 2008a).

An electronic portfolio provides many advantages to its paper-based counterpart (van Wesel & Prop, 2008a; 2008b). Benefits include hyperlinking navigation, increasing

portability and remote access, a fun aspect with images possible, increasing ICT competences, more compact format, adding multimedia, and the ease of sharing and maintaining multiple versions (van Wesel & Prop, 2008a). An electronic portfolio also brings "better educational outcomes afforded by the ability to annotate and contextualize items in the portfolio" (Lambert & Corrin, 2006, p. 441). In particular, the study of van Wesel and Prop (2008b) showed the positive effect on students' learning outcomes. The result was "the average grade of the students working with an electronic portfolio (n=153), based on the six block assessments, is significantly higher than those of the students working with a paper-based portfolio (n=177)" (van Wesel & Prop, 2008b). It "suggests a deeper level of reflection among the students using an e-portfolio" (van Wesel & Prop, 2008b). The ePortfolio has been developed over the same period of time as student learning outcomes needed a repository to demonstrate evidence of academic accomplishment and knowledge.

Dissertations in electronic formats have also emerged as valuable places which can embed motion pictures of biological slides, surgical procedures, engineering technologies, and even dance and drama. Such additions could not have been included in print formats. As noted earlier, an electronic dissertation that included video files was published by Giraldo in a December 2010 doctoral thesis in plant pathology. This work included nine video files in her doctoral dissertation. Fosberg (2011) stated that "because her research has global impact on agriculture and hunger, Giraldo's dissertation includes video files that let the reader view images of fluorescent proteins and the infection mechanisms. The images might make it possible for researchers who would not otherwise have the means to view and understand the development of the disease. In addition to the

content videos, the dissertation also has an eight-minute video of the techniques Giraldo used to inoculate rice plants and prepare the diseased tissue for imaging." Her work already has been published in several refereed journals as well as being presented at national and international meetings (Fosberg, 2011). This electronic dissertation earned Kansas State plant pathologist an elite award from the Networked Digital Library of Theses and Dissertations (NDLTD) in 2011. NDLTD have actively encouraged and promoted publishing electronic theses and dissertations (ETD) in order to enhance the sharing knowledge worldwide.

Lastly, Beryle (1998) reported that Howard Gardner's multiple intelligences theory provides "implications for planning new curricular, especially for children with dyslexia" and the theory "allows an open-ended approach to assessing dyslexic children's intelligence" (p. 34). With this understanding of multiple intelligences, higher education students with dyslexia who are intelligent but have difficulties in learning to read also can be helped by multimedia digital research papers. It can be noted that universities and academic libraries can now serve those with dyslexia by providing them with multimedia alternatives. This includes moving print to audio files.

Academic Libraries and Information Literacy (IL)

History of Academic Library Instruction

From the 17th to 19th Centuries, German library literature records various examples of library instruction (Lorenzen, 2001). In 1880, during his third year as

Harvard University librarian, Justin Winsor (1880) stated that libraries have been the center of the university and the natural location to teach classes. Observing a new interest in academic 'libraries as educational agencies,' Winsor (1880) proclaimed that the college library had embarked on a 'new career.' His contribution in the profession of librarianship includes library use instruction as it related to the broader, higher educational goals during the past century. In the Winsor model, user instruction may have been merely one response to changing circumstances, but he still embraced library use instruction as the symbol of the arrival of a new age. The new ideals of graduate research, disciplinary specialization, and scholarly production were accompanied by another development that had profound implications for how books and libraries would be used. That is the advent of seminar instruction.

In 1886, Melvil Dewey (1886) stated that "professor after professor sends his classes, or goes with them to the library and teaches them to investigate for themselves and to *use* books, getting beyond the method of the primary school with its parrot-like recitations from a single text." The librarians who along with professors had been caught up in the swirling change and growth that marked that age continued to seek concepts for the academic library that would help them earn a place in the academic community. Winsor (1880) proclaimed the library's new career as the instruction of students in the use of the library. After the turn of the century, higher education solidified the gains it had made in the previous century and these had an impact on the how the role of the library intersected with the roles of faculty and students. From 1875 to 1917, Arthur E. Bestor, Jr. (1953) described the period as a time of transformation in American scholarship. It is the ideals of research, technical training, and liberal education in all of

their diversity became fully operative, achieving professional, intellectual, and bureaucratic stability (Bestor, Jr., 1953).

Given the history of its growth and development, academic libraries have gone through a paradigm shift from functionally as information repositories to learning enterprises (Bennett, 2009; Lewis, 2007; Oakleaf, 2010). Oakleaf (2010, p. 37) stated that "in the new paradigm, academic librarians articulate student learning outcomes" through the teaching and learning activities of their institutions. Academic librarians emphasize student learning outcomes not only as service providers, but also as educators (Bennett, 2009; Bundy, 2004). The Institute of Museum and Library Services (2000) defined outcomes as the "benefits or changes for individuals or populations during or after participating in program activities, including new knowledge, increased skills, changed attitudes or values, modified behavior, improved condition, or altered status" (p.20). In the distinctive roles of academic librarians, they have been actively participating in both the planning and implementation of student learning outcomes as information specialist, teacher, and instructional consultant.

In the last quarter of the 20th century, teaching librarians became increasingly common. Several researchers reviewed in detail the scholarly literature on bibliographic instruction in academic libraries (Hardesty, Schmitt & Tucker, 1986; Kirt, 1975; Tucker, 1980; Oakleaf, 2010). By 1974, the term information literacy was coined by Paul Zurkowski to describe the "techniques and skills" known by the information literate "for utilizing the wide range of information tools as well as primary sources in molding information solutions to their problems." The term reflected essential technological changes and the impact on modern life, but it took several decades to come into general

use in the library community. In 1989, Tuckett addressed the issues facing academic librarians who need to teach information literacy with computers. It connected information literacy directly to computer technologies. Tuckett (1989) believed that academic librarians need to teach both finding and evaluating information using computers, so both information literacy and computer training needed to be jointly addressed in academic institutions. Today's academic libraries put emphasis on information literacy along with information communication and technology (ICT). Also used is the term digital literacy when librarians provide students with library instruction.

Definition of Information Literacy

According to the Oxford Dictionaries Online, 'literacy' means "the ability to read and write." The various definitions of literacy such as "the ability to read and write," now include the basis of how people learn. The North Central Regional Educational Laboratory and the Meteiri Group (2003) reported that traditional or basic literacy is still necessary for literacy in the digital age. Yet, the past decade has found that rapid growth of Internet usage with technologies advances have altered the new generation's definition of learning and literacy. Before discussing the definition of information literacy, it might be instructive to address what is meant by learning and literacy.

What is learning? Ambrose, Bridges, DiPietro, Lovett, and Norman (2010) summarized and defined learning from Mayer's (2002) article. They defined "learning as a *process* that leads to *change*, which occurs as a result of *experience* and increases the potential for improved performance and future learning" (Ambrose, et al, 2002, p. 3). Three critical components to this definition are: 1) "learning is a *process*, not a product", 2) "learning involves *change* in knowledge, beliefs, behaviors, or attitudes", and 3)

"learning is not something done to students, but rather something students themselves do" (Ambrose, et al, 2002, p. 3). Today's definition of information literacy would need to reflect on how learning works and how people learn in the digital age.

Then again, what is literacy? Beyond the ability to read and write, UNESCO (2004) defined literacy as "the ability to identify, understand, interpret, create, communicate, compute and use printed and written materials associated with varying context. Literacy involves a continuum of learning in enabling individuals to achieve their goals, to develop their knowledge and potential, and to participate fully in their community and wider society." (p. 13). The term 'literacy' has changed its type and meaning over time as values in society transform.

The development of the original idea of 'information literacy' can find its roots in the 19th century that emerged relatively early in the minds of librarians who framed library user instruction (Adler, 1897; Dewey, 1891; Green, 1876; Mathews, 1877; Perkins, 1876; Robinson, 1880; Winsor, 1880; Winsor, 1884). The term and the concept of information literacy gained popularity in the 1990s and have been actively promoted by the academic library community.

The most frequently used definition of information literacy comes from the American Library Association (ALA)'s first national report on this issued in 1989. ALA reported that information literacy is a set of abilities requiring individuals to "recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information" (ALA, 1989). ALA's definition became the basis for later approaches to information literacy (ALA, 2000; Bawden, 2008). Beyond this definition

of information literacy, ALA (2000) also posed new challenges for the medium of information literacy in the digital environment. It stated that (p. 2):

> Information literacy also is increasingly important in the contemporary environment of rapid technological change and proliferating information resources. … In addition, information is available through multiple media, including graphical, aural, and textual, and these pose new challenges for individuals in evaluating and understanding it.

Under this definition, the sources of information include graphical, aural, and textual elements. It addresses new challenges for the issues of new additional skills that are used and presented during and after the research process.

The primary goal of information literacy is to facilitate people to become lifelong learners as information literate individuals (Warmkessel & McCade, 1997). In particular, ALA (2000) described an information literate individual as able to (pp. 2-3):

- determine the extent of information needed
- access the needed information effectively and efficiently
- evaluate information and its sources critically
- incorporate selected information into one's knowledge base
- use information effectively to accomplish a specific purpose
- understand the economic, legal, and social issues surrounding the use of information, and access and use information ethically and legally

Information literacy is commonly used in all academic disciplines, in all learning environments, and in all levels of education as the basis for lifelong learning (ALA, 2000). As a self-directed learner, information literate individuals are able to master content and expand the implications of research. This latter point might distinguish print literacy from media literacy but it does address the fluency of communication in a digital environment.

In addition, for academic librarians, the main focus of student learning outcomes is information literacy (Oakleaf, 2010; 2011). Kuhlthau, Maniotes, and Caspari (2007) described this process: "information literacy forms the basis of how people learn in the information environment of the 21st century. By combining the underlying concepts of information literacy with major subject area curriculum standards, guided inquiry prepares students for living and working in the technological information society." (p. 91). The American Association of School Librarians (AASL) and the Association for Educational Communications and Technology (AECT) published information literacy standards for student learning. They defined information literacy in three standards with indicators of students who have achieved them. The three standards illustrated that the student who is information literate (AASL and AECT, 1998, pp. 1-3):

- accesses information efficiently and effectively;
- evaluates information critically and competently;
- uses information accurately and creatively.

AASL and AECT's (1998) standards for student learning included and emphasized requirements for posing a question, identifying relevant sources, locating, evaluating, and synthesizing or using information in a product.

In recent years, a number of new literacy terminologies and skills have emerged. But still, information literacy is related to the various other "literacies of information," such as computer literacy, media literacy, digital literacy, e-literacy, visual literacy, network literacy, or information and communication technology (ICT) literacy. For instance, higher education institutions have started to identify ICT literacy "as a core competency (as opposed to 'information literacy' or 'technology literacy')" (Tyler, 2005,

p.3). It might be summarized that Katz proposes that ICT literacy evolves into information literacy in digital environments (Katz, 2005; Katz, 2007a; 2007b, Katz & Macklin, 2007; Katz, et al. 2004). Katz (2005) stated "the most pedagogically effective definition of ICT literacy combines both information literacy and technical competence" (p. 3):

> ICT literacy is the ability to appropriately use digital technology, communication tools, and/or networks to solve information problems in order to function in an information society. This includes having the ability to use technology as a tool to research, organize, and communicate information and having a fundamental understanding of the ethical / legal issues surrounding accessing and using information (The National Higher Education Information and Communication Technology Initiative, 2004).

A library perspective on ICT literacy in the 21st century begins with a view of information literacy's core component as "the ability to know when information is needed, locate it efficiently, evaluate its quality, and use it to build and communicate new knowledge," which is based on ALA (2000)'s definition (Scharf, 2013, p. 3). Some additional learning outcomes—such as critical thinking and research skills—are also needed with student information literacy skills for general academic skills (Oakleaf, 2010; 2011).

Digital Learners in the Digital Age

The term and concept of "digital natives" was first coined by Prensky (2001) to classify individuals born in or after 1980. Prensky (2001) described digital natives as those who have grown up with and surrounded by digital technologies, such as computers,

cell phones, videogames, digital music players, and all the other digital devices as these became integral parts of their lives. According to Prensky (2001), digital natives are used to adopting new skills with digital technologies easily and radically, and they learn differently from previous generations, so-called digital immigrants.

However, other researchers have argued against the early description of digital natives due to the lack of empirical evidence to support such claims for these individuals (Bennett, Maton, & Kervin, 2008; Brown & Czerniewicz, 2010; Helsper & Eynon, 2010; Kennedy, Judd, Churchward, Gray, & Krause, 2008; Margaryan, Littlejohn, & Vojt, 2011; Maton & Bennett, 2010; Ng, 2012; Nasah, DaCosta, Kinsell, & Seok, 2010). The researchers argued and suggested that it may be more a matter of information or digital literacy rather than a generational trait. Ng (2012) summarized the main points of the arguments with this analysis (p. 1065):

- *the generation factor where those born in and after 1980 are digital natives.* The researchers argued that it is not the age that should be considered in describing the youths of today but other more important factors such as the availability of technology and breadth of use, prior experience, self-efficacy and education.
- *the availability of technology to digital natives and their ubiquitous usage.* The researchers argued that the use of technology by young people is different in education in that most lack the skills and strategies to use them for learning.
- *the rhetoric that because young people have grown up in a world surrounded by technology, their brains develop differently to the adults of previous generations.* The researchers argued that there is no empirical evidence to suggest that the brain structure is different between adults and those who use the Internet and other technologies frequently.

Today's students are entering colleges and universities with a variety of experiences involving the Internet and other digital technology. Among undergraduate students, social media platforms, such as Wikipedia, social networking sites (e.g., Facebook), user reviews (e.g., reviews in Amazon.com), video sharing sites (e.g.,

YouTube), social Q&A sites (e.g., Yahoo!Answers), blogs, and microblogs (e.g., Twitter), can serve as useful, important information sources for everyday-life information seeking (Kim, Sin, Yoo-Lee, 2014; Sin & Kim, 2014).

However, research has indicated that without formal instruction, college students struggle to evaluate critically the information they searched for in their research projects and assignments (Graham and Metaxas, 2003). The students often lack the information and communication technology (ICT) literacy skills necessary to apply those skills in the context of information technology—locating, evaluating, and communicating information and this is exacerbated with the overabundance of information available today (Katz, 2005; Katz, 2007a; 2007b; Katz & Macklin, 2007; Tyler, 2005). Margaryan, Littlejohn, and Vojt (2011) also claimed that university students have a limited understanding of how digital technologies can support their learning. Furthermore, lecturers' approaches to teaching are influenced by students' expectations of learning with digital technologies (Margaryan, Littlejohn, and Vojt, 2011). In addition, Ng's (2012) investigation showed that the undergraduates' perceptions of their own digital literacy "improved through the explicit teaching and learning in the course about new educational technologies and their integration into their learning" (p. 1077). These studies indicate that students will need to be guided by instructors in order to improve their information or digital literacy skills in an educational environment.

Then, who is a digitally literate individual? Ng (2012) stated that "a digitally literate individual should be able to adapt to new and emerging technologies quickly and pick up easily new semiotic language for communication as they arise. The more digitally literate the individual, the easier it is for him/her to adapt, that is switch to the 'new

literacies' mode" (p. 1066). According to the American Library Association (ALA)'s (2013b) digital literacy task force which is led by the ALA Office for Information Technology Policy (OITP), a digitally literate person (p. 2):

- possesses the variety of skills—cognitive and technical—required to find, understand, evaluate, create, and communicate digital information in a wide variety of formats;
- is able to use diverse technologies appropriately and effectively to search for and retrieve information, interpret search results, and judge the quality of the information retrieved;
- understands the relationships among technology, lifelong learning, personal privacy, and appropriate stewardship of information;
- uses these skills and the appropriate technologies to communicate and collaborate with peers, colleagues, family, and on occasion the general public;
- uses these skills to participate actively in civic society and contribute to a vibrant, informed, and engaged community.

Yet, not all digital learners in the digital age can be declared as digitally literate. Even digital natives can be taught digital literacy (Ng, 2012). Academic libraries educate digitally literate students to improve their learning through the relevant library instructions.

Role of Academic Libraries in the Digital Age

Two major goals of all types of libraries are promoting users' literacy development and fostering lifelong reading habits (Farmer & Ivanka, 2011). These library missions still continue, although the idea of literacy has been changed as time goes by and it encompasses a wider range of skills, competences, or attitudes (Lankshear & Knobel, 2008). The concepts of literacy are often closely related with the way of learning to read and write within certain time periods (Leu, et al., 2007) and it is also

closely connected with librarians' roles for student learning in an academic library environment. In the future, significant changes may be necessary in the roles libraries will incur in higher education; moreover, academic librarians will need to define their role in an expanding arena involving different literacy competencies. The librarians will need to work with a variety of academic partners to address the improvement of student learning and the refinement of information literacy.

Today's undergraduate students are generally able to use unfamiliar technologies in their learning; furthermore, they are able to learn and use educational technologies in a meaningful way with the guidance of an instructor (Ng, 2012). Hence, even today's digitally literate students also need to be guided (Ng 2012). Academic librarians can play a pivotal role in mentoring for this. At this juncture, academic librarians require having knowledge of the various digital technology tools that are beneficial for their own teaching and for their students' learning.

Furthermore, the value of collaboration between librarians and faculty in higher education is especially emphasized in the digital age. In library and information science literature, numerous researchers have advanced that information literacy is more effective and stronger through working relationships between librarians and faculty (Arp, Woodard, Linstrom, & Shonrock, 2006; Black, Crest, & Volland, 2001; Cunningham, & Lanning, 2002; Farber, 1999; Raspa & Dane, 2000). This is a key component to students' perceptions of information literacy as an important aspect of their education and their success both in and out of the classroom. According to Breivik (2005), the most practical strategy to increase library use is that faculty "create assignments that require thoughtful use of library sources and services" (p. 25). Clearly, both librarians and faculty will be

required to have more breadth and depth of knowledge and skills across the dimensions of information literacy and other technologies in higher education. Their effective and successful collaboration in working together will be able to lead to students' success in university studies and ultimately guide their lifelong learning in the digital age. Online education is ripe for a rapid development of information technologies that enhance learning through multimedia with a result that digital literacies can transform quickly in this digital age.

Lastly, in order to instruct students to employ better information-related practices and build better partnerships with faculty members, academic librarians "may need to learn more about how real researchers do research" (Foster, 2014, p. 3). Foster (2014) argued that "the better we understand the practices of people who exemplify information literacy, the better we can help students to succeed in their research and be more critical and effective in their information practices" (p. 4). Learning more about how researchers really work will be one of the best ways to assist both students and faculty members with research-related practices. This may also improve the foundational knowledge of librarians who instruct faculty and students in a complex information world.

Theoretical Model and Research Questions

Proposed Model for Digital Scholarly Information

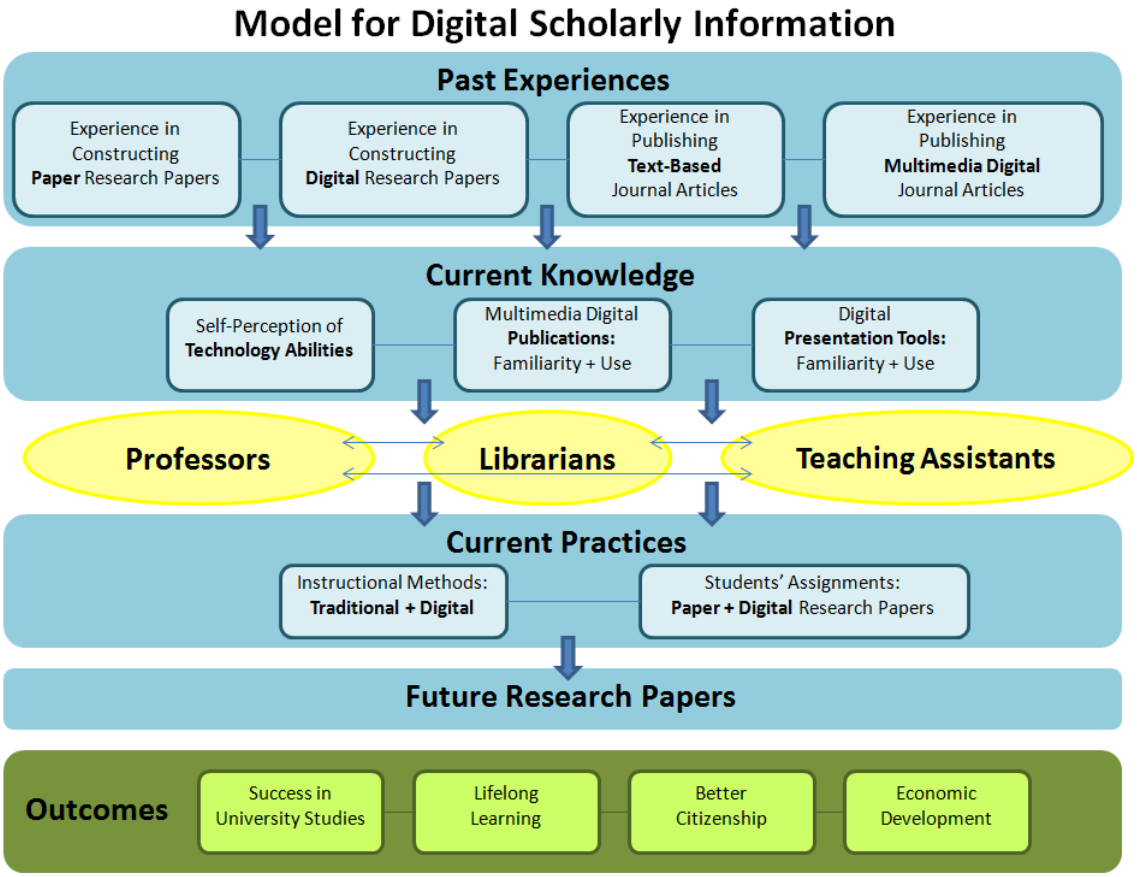


Figure 2-1. A Model for Digital Scholarly Information

Research Questions and Hypotheses

The overall problem area for this investigation deals with changes that may occur in the evolution of what it means to be an educated person. It is assumed that the creation of a competent research paper provides evidence of an educated person. It is further assumed that the definition and format of the research paper are undergoing dynamic changes in the emerging world of multimedia production. An important purpose here is to

assess if bridges exist in the understanding of research paper changes as they are linked to past and future literacies which, in turn, redefine the meaning of an educated person. Below are propositions that might be applied to this problem area.

RQ1. How are current knowledge and practices of educators (professors, librarians, and teaching assistants) affected by use of multimedia digital publications (MDP)?

- H1a. Relatively younger educators will have more use of MDP compared to older educators.
- H1b. Educators in the science areas will have more use of MDP than those in the areas of humanities, social science, or professional schools.
- H1c. Educators who have higher self-perception of their technology abilities will have more use of MDP than those who have lower self-perception of technology abilities.
- H1d. Educators who are more familiar with MDP will have more use of MDP than those who are less familiar with MDP.
- H1e. Educators who use more digital presentation tools (DPT) will have more use of MDP than those who use fewer DPT.
- H1f. Educators who use digital instruction methods will have more use of MDP than those who use traditional instruction methods.

RQ2. Are there differences among professors who themselves publish using multimedia digital publication (MDP) formats compared to professors whose publications are in more traditional text formats?

- H2a. Relatively younger professors will publish more in journals using MDP format than older professors.
- H2b. Professors in the science areas will publish more in journals using MDP format than those in the areas of humanities, social science, or professional schools.
- H2c. Professors who use MDP will publish more in journals using MDP format than those with low uses of MDP.
- H2d. Professors who use MDP will publish more in journals using MDP format than those with low uses of MDP.
- H2e. Professors who had one or more articles published in journals using MDP formats will be more likely to give assignments to students using MDP formats.

RQ3. How do professors evaluate components in each of the two formats (print and digital formats) over time?

- H3a. Professors' evaluation gap of 'content and references' in each of the two formats will decrease over time.
- H3b. Professors' evaluation gap of 'visual aids' in each of the two formats will decrease over time.
- H3c. Science area professors' evaluation gap of 'visual aids' in each of the two formats will be lower than professors in humanities, social sciences, or professional schools.

RQ4. How do educators (professors, librarians, and teaching assistants) define an ‘educated person’ in the digital age?

- H4a. There will be common keywords to define an educated person.
- H4b. There will be some differences in the frequencies of keywords used to define an educated person according to the individual’s position and academic area.

CHAPTER 3: METHODS

Research Design

The proposed research design involves a survey and interviews. The survey portion could be characterized as a correlational study involving three groups of individuals from different disciplines. A non-random, convenience sample is used for the survey with each participant being queried on past, present, and anticipated practices regarding research paper formats. Open-ended sections in the survey and selected interviews with six volunteers will be analyzed as qualitative data to identify patterns or categories of interest stated by individual respondents.

Sample

The population for this study would ideally include all full-time professors, librarians, and TAs at Rutgers University with the sample randomly selected from these groups of individuals. Such an approach assumes the availability of contact information for each individual in each group and this information is not available. Alternative approaches to creating a viable sampling frame do not appear viable given privacy concerns of employees and students. Even if such information were available it would still incur two obstacles: the cost in time and effort in securing such a list for this unfunded study and the assumption that such a new topic is ready for more wide-scale hypothesis testing. This is a preliminary study and its focus is hypothesis defining in the hope that it can then lead to a more extensive investigation with a large, random sample of potential respondents.

The size and type of the survey **s**ample can be viewed from a number of different perspectives. If this study were funded, then a multi-part investigation could begin with a problem defining approach and then move to collect representative data. If the study were funded it might be possible to engage a large sample of over 1,200 individuals randomly selected at different (randomly) selected colleges and universities. Such a sample might allow for testing hypotheses at $\alpha = .05$ with a confidence interval of ±3%. However, this is not a funded study and it is not conducted in an area where prior research has identified variables and constructed viable models of how information literacy may define what it means to be an educated person.

To define the issues present during a transition from paper-based print to multimedia digital products will require that an initial investigation include individuals from different disciplines. Three groups are identified as appropriate for this study since their roles interact directly with students who are involved in research papers: 1) full-time professors (in their role as research and course instructors), 2) librarians (in their role as library instruction and information literacy instructors), and 3) TAs (in their role as full or part-time lecturers for the course and also as current graduate students). Their roles are important as integral members of the teaching and learning mission for students' research in colleges and universities. These groups have core knowledge about undergraduate research and they engage in pursuing the shared goal of educating these students. It is assumed here that the knowledge gained in doing a research paper contributes in a meaningful way to defining an educated person.

There is a growth in collaborative efforts involving teaching faculty and librarians to reach larger numbers of students and to offer students support in building strong

academic information literacy skills (Arp, Woodard, Linstrom, & Shonrock, 2006; Black, Crest, & Volland, 2001; Cunningham, & Lanning, 2002; Dorner, Taylor, & Hodson-Carlton, 2001; Farber, 1999; Raspa & Dane, 2000). The professors and librarians work cooperatively to promote an effort to integrate information literacy into the curriculum. The ideal cooperative relationship between teaching faculty and librarians might be best described by a pioneer in this field, Evan Farber (1999) who stated, "…where both the teacher's objectives and librarian's objectives are not only achieved, but are mutually reinforcing—the teacher's objectives being those that help students attain a better understanding of the course's subject matter, and the librarian's objectives being those that enhance the students' ability to find and evaluate information" (p. 233). A successful collaboration would be expected to produce a seamless blend of core subject with research skills and also information literacy proficiency as ideal ways to meet students' needs with full faculty support. The learning outcomes that would provide evidence of what is learned is not addressed in this study.

In this study, the sample of TAs are current graduate students, and at the same time they teach their classes as part-time lecturers (PTLs) or as assistants to professors. TAs in the classroom have direct contact with students either as a class or in a recitation group. For this, they are trained through a series of workshops designed to develop technological skills and enhance teaching. TAs at Rutgers University are required to attend at least four sessions listed below to earn a certificate before entering the classroom:

1) Managing a course web site (*Sakai*)
2) Online grade reporting and communication
3) Creating *Excel* spreadsheets for grading

4) Getting started with *RefWorks* and *Flow*
5) Basic web design
6) Copyright issues for academic research and publication
7) Copyright issues for teaching
8) Lecture recording and *Podcasting*
9) Creating *eBooks* for the classroom
10) Creating *PowerPoint* presentations for teaching
11) Using media with *PowerPoint* presentations
12) Getting started with *RefWorks* and *Flow*
13) *Windows Movie Maker*
14) Introduction to *Prezi*

Through a series of workshops, TAs at Rutgers University are well trained to use multimedia digital publications and tools. These workshops are offered by the Center for Teaching Advancement and Assessment Research (CTAAR) and the TA Project. Certificates are awarded by the TA project. In order to guide undergraduate students effectively, professors, librarians, and TAs may also work collaboratively with each other although the normal mode of instruction is one teacher to a class of students. In all, these three groups are essential to this study and individuals will be selected from different disciplines.

Four academic areas are identified by aggregating specific disciplines into broad disciplinary categories: 1) sciences, 2) social sciences, 3) humanities, and 4) professional schools. For instance, individuals designated from the sciences are found in departments of chemistry, earth science, physics, biology, molecular biology, biochemistry, botany, zoology, or anatomy. Social sciences hold appointments in departments of anthropology, psychology, economics, political science or government, sociology or social psychology, communication or information technology and informatics. Humanities include departments of English language and literature, foreign language and literature, history,

philosophy and religion, or theology. Lastly, professional schools include business schools, social work, education, nursing, human resource management, and labor studies.

The survey **s**ample included 148 participants—60 professors (full-time faculty), 42 librarians, and 46 TAs from Rutgers University in New Jersey—who were recruited as volunteers. As described above, individuals are solicited to represent four academic areas: sciences, social sciences, humanities, and professional schools. This is a non-random, convenience sample and its purpose is to define how information literacy is addressed in a multimedia world where the format of the research paper is evolving from a long-form to incorporate audio and video information.

The personal interview sample consists of 16 participants— eight professors, four librarians, and four TAs. They all agreed and gave their permission to use their name with quoted comments for this study. The relatively small sample size will limit the ability to generalize to larger populations of professors, librarians, and TAs. It is hoped that the data from this study might be used to define the model and create hypotheses useful in a larger study.

Table 3-1. Sample and Dependent Variables (DVs): 3 Sub-groups x 4 Academic Areas

	Humanities	Social Science	Science	Professional Schools
Professors	DV1 to DV3	DV1 to DV3	DV1 to DV3	DV1 to DV3
Librarians	DV1	DV1	DV1	DV1
TAs	DV1	DV1	DV1	DV1

- **DV 1:** Use of multimedia digital publications (MDP) (ex. video journal articles)
- **DV 2:** Experience with publishing articles in any journals using multimedia digital formats (ex. PowerPoint, video, website, etc.)
- **DV 3:** Experience with giving assignment to students using multimedia digital formats as their research papers (ex. PowerPoint, video, website, etc.)

Measurement / Instrumentation

The survey uses Likert scales. The number of scale points used with such a responses, specifically, 4, 5, 7 and 11 Likert-scale points, is still controversial (Leung, 2011; Lim, 2008; Wakita, Ueshima & Noguchi, 2012). Yet, research findings show that "having more scale points seems to reduce skewness, and the 11-point scale, ranging from 0 to 10, has the smallest kurtosis and is closest to normal … and suggests the use of an 11-point scale as it increases sensitivity and is closer to interval level of scaling and normality" (Leung, 2011, p. 412). This survey uses "don'know," "don't use," "cannot do," or "not applicable" as part of its eleven-point Likert style response scale. This study emphasizes individuals' knowledge and experience as well as perceptions. Additional personal information is not requested of participants. Open-ended responses follow each

major section of the survey. Respondents were asked to volunteer for personal interviews to expand on their responses to the scaled items and their open-ended comments.

Study Site / Location of Procedures

All of the subjects (professors, librarians, and teaching assistants) were recruited on Rutgers University campus.

Detailed Study Procedures

The quantitative portion of the study is a questionnaire survey which consists of Likert-type scales and "Yes/No" questions about perceptions and evaluations of research papers over the recent past and likely future. The qualitative portion of the study involves open ended questions asked of participants so they can expand on information provided in the questionnaire. Personal interviews of 16 individuals provided in-depth, descriptive data on how they perceive and evaluate the research papers in any formats over time. Interviews were tape-recorded and transcribed.

There was a one-time response to a brief questionnaire for 148 participants which should take no longer than 30 minutes to complete (depending on amount of detail provided in the open-ended questions). 16 interviewees (eight professors, four librarians, and four TAs) were recruited for interviews. These in-depth personal interviews were approximately 30 minutes in length.

Any risks involved for the participants in the project would be their recollection of research paper changes, a topic many individuals do not often reflect on. The risk/benefit ratio of the proposed research sees very little risk to participants and greater potential benefits to how knowledge is reported.

The survey data will be stored in the Principal Investigator's computer database with access locks (security code accessible only to the Principal Researcher) for three years after the completion of the research. All paper documents will be shredded and computer files of data will be deleted after five years.

Consent Procedures

This study requires the approval of the Rutgers University Institutional Review Board (IRB) for the protection of human subjects in research. The questionnaire was presented to individuals following their completion of the consent form for this research. All subjects gave their consent in order to participate. The consent form followed the suggested language of the Rutgers IRB template.

Those who agreed to provide additional information in a personal interview were given a separate consent form. These interviews were conducted in person by the Principal Investigator with the respondent. 16 personal interviews took place. The content of the interviews focused on responses to the survey with particular attention to the open-ended responses. Eight professors, four librarians, and four teaching assistants were selected for these interviews.

The personal interviews were audio recorded and each respondent is asked to sign the audio consent form. In all, the interviewees were signing three consent forms: one for the survey, one for the interview, and one for the audio taping.

Internal Validity

It is expected that threats to internal and external validity may occur in this study given it uses a non-random and small sample size. The simple design of this study does not address internal validity issues such as before/after effects, maturation, and related areas. Exploratory data analyses are used with quantitative and qualitative data to suggest hypotheses for future investigations.

Data Analysis

Analyses of responses include overall correlational analyses with exploration using factor analyses. Exploratory data analyses include factor analysis, hierarchical multiple regression models, and binary logistic regression as well as statistical interactions among variables. Models include all cases (N=148). This is the first study of its type known on this topic and a mixture of exploratory data analyses and qualitative data analyses might be used to suggest hypotheses for later investigations.

CHAPTER 4: RESULTS

Participants and Demographics

Survey Participants and Response Rate

A total of 509 surveys were distributed via *Qualtrics* using university email accounts. Among them, a total 148 individuals responded for a 29.1% response rate. Table 4-1 provides a breakdown showing how many surveys were distributed and responded to by each educator group. Note, for example, that 56 subject librarians of Rutgers University received this survey and that 42 responded (75%). The yields from each group's survey participants and response rate were: 60 professors (31.1%), 42 librarians (75%), and 46 TAs (17.7%). The participation numbers of each group were relatively similar compared to its response rate.

Table 4-1. Numbers of Survey Participants and Response Rate

	Distributed Survey	Respondents to Survey	Response Rate
Professors	193	60	31.1%
Librarians	56	42	75.0%
TAs	260	46	17.7%
Total	**509**	**148**	**29.1%**

Follow-up Personal Interview Participants

A total number of 16 interviewees participated in follow-up personal interviews: eight professors, four librarians, and four TAs. Table 4-2 presents each interviewee's

name, role, general academic area, and department. They all agreed and gave their permission to use their name with quoted comments for this study. These interviews included two faculty members who had published in a peer-reviewed video journal (JoVE). Also as resource individuals for undergraduate education, two faculty members were invited and agreed to be interviewed to share their thought about 'what it means to be an educated person in the digital age.' Both of these individuals are in charge of undergraduate education at Rutgers University.

Table 4-2. Follow-up Personal Interview Participants

	Humanities	**Social Sciences**	**Sciences**	**Professional Schools**
Professors	Martin Gliserman (English)	David Redlawsk (Political Science)	Nancy Walworth (Pharmacology)	Alexander Settles (Business)
Librarians	Jane Sloan (Humanities & Social Sciences)	Kayo Denda (Social Sciences)	Ryan Womack (Sciences & Social Sciences)	Roberta Tipton (Professional Schools & Social Sciences)
TAs	Danielle Bradley (History)	Frederick Bentley (Industrial Relations and Human Resources)	Jason Perry (Computer Science)	Deniz Appelbaum (Business)
***JoVE* People**	• Bonnie Firestein (Professor of Biology and Neuroscience) • Noshir Langrana (Professor of BioMed Engineering)			
Resource People	• Barry Qualls (Vice President of Undergraduate Education & Professor of English) • Kurt Spellmeyer (Director of Writing Program & Professor of English)			

These in-depth personal interviews averaged 31 minutes in length with a range of 20.2 minutes to 54.2 minutes. Data were obtained from interviews via transcription. All of the interviews were transcribed into Word files, excluding non-meaningful utterances such as uh, uhm, etc., by the principal investigator. An initial categorization of the data was derived from each interview question. The most prevalent domains and keywords from both survey open-ended answers and interview transcriptions were combined and analyzed using *NVivo* as a thematic analysis of qualitative data analysis. Two main questions using the thematic analysis were about the meanings of an 'educated person' and a 'digitally literate person' in the digital age.

General Academic Area

Figure 4-1 offers a graphic display of four academic area distributions used in this study. The percentages of each academic area were: humanities (28%), social sciences (24%), sciences (30%), and professional schools (18%). Figure 4-2 shows a stacked column chart of four academic areas by role of respondent with each count. Academic area was used as a significant factor in most of the analyses in this study.

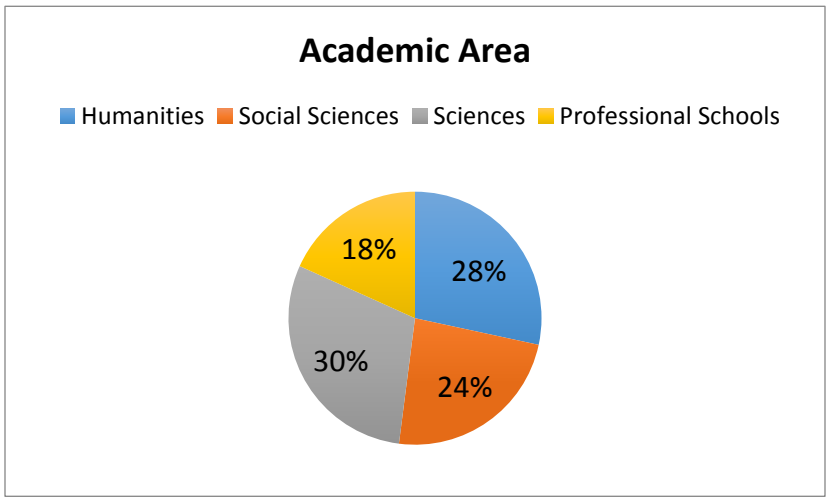


Figure 4-1. Academic Area Distribution

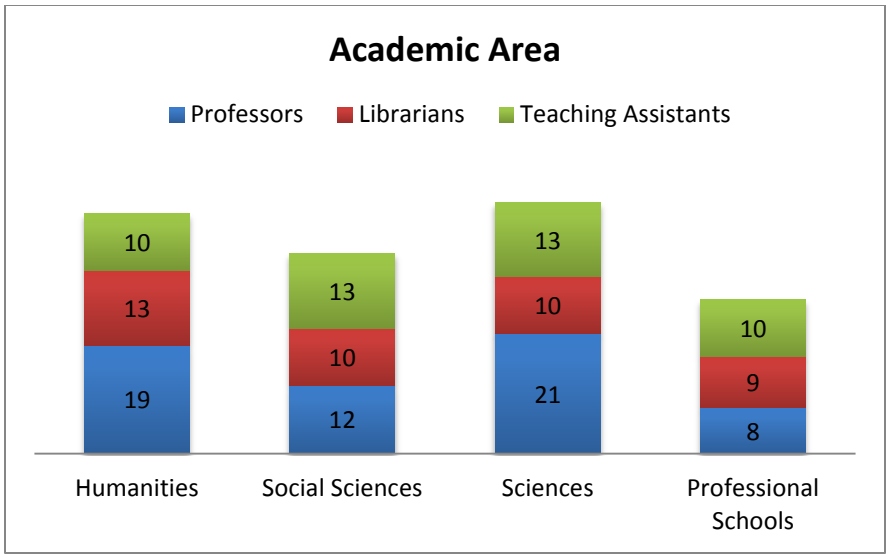


Figure 4-2. Academic Area by Role of Respondent

Gender

Figure 4-3 provides the percentage of gender distribution in this study. Approximately 45% of participants were male, 54% were female, and 1% did not answer about their gender. These percentages are similar to the overall ratio of male and female population at Rutgers University in general. Gender by role of respondent is presented in Figure 4-4. Gender was not used as significant independent variable for undergraduate students' education.

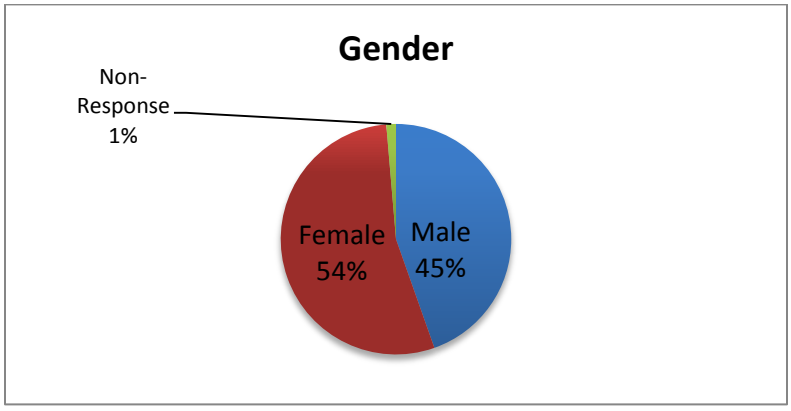


Figure 4-3. Gender Distribution

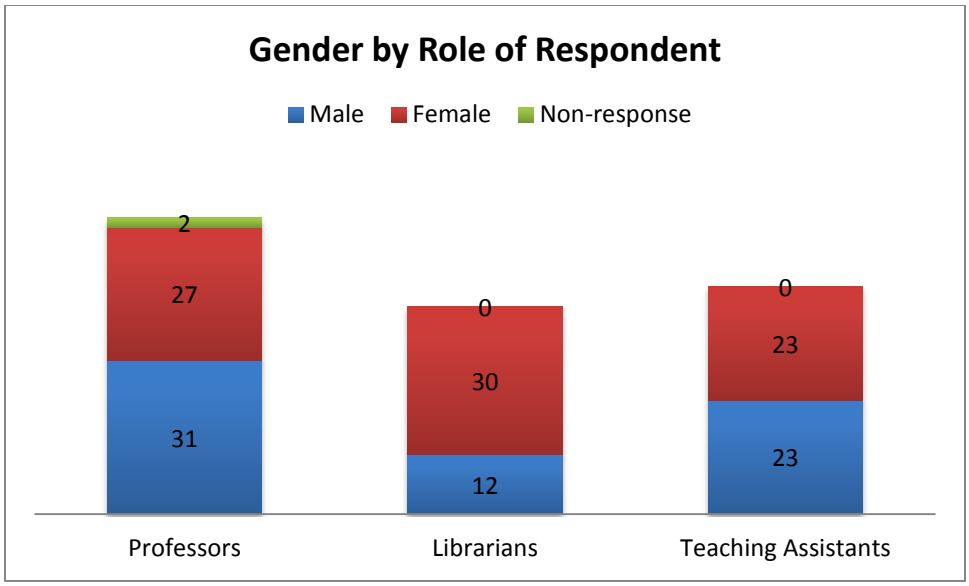


Figure 4-4. Gender by Role of Respondent

Number of Teaching Years & Age

Table 4-3 indicates the descriptive statistics of number of teaching years. Mean of each group's number of teaching years were: professors (24.4 years), librarians (19.4 years), and teaching assistants (4.4 years). Figure 4-5, 4-6, and 4-7 shows age distribution of each group. Most frequent age range for each group were: professors (61 or more years old, 23 counted), librarians (61 or more years old, 15 counted), and teaching assistants (26-30 years old, 20 counted). Number of teaching years and age was used as one of variables for the first research question.

Table 4-3. Descriptive Statistics of Number of Teaching Years

Descriptive Statistics

3 Gorups		N	Minimum	Maximum	Mean	Std. Deviation
Professors	How long have you been instructing / teaching students? Number of years.	57	5.00	52.00	24.4386	12.47428
	Valid N (listwise)	57				
Librarians		36	.00	42.00	19.4444	11.92703
	Valid N (listwise)	36				
Teaching Assistants		38	.00	15.00	4.3816	3.24128
	Valid N (listwise)	38				

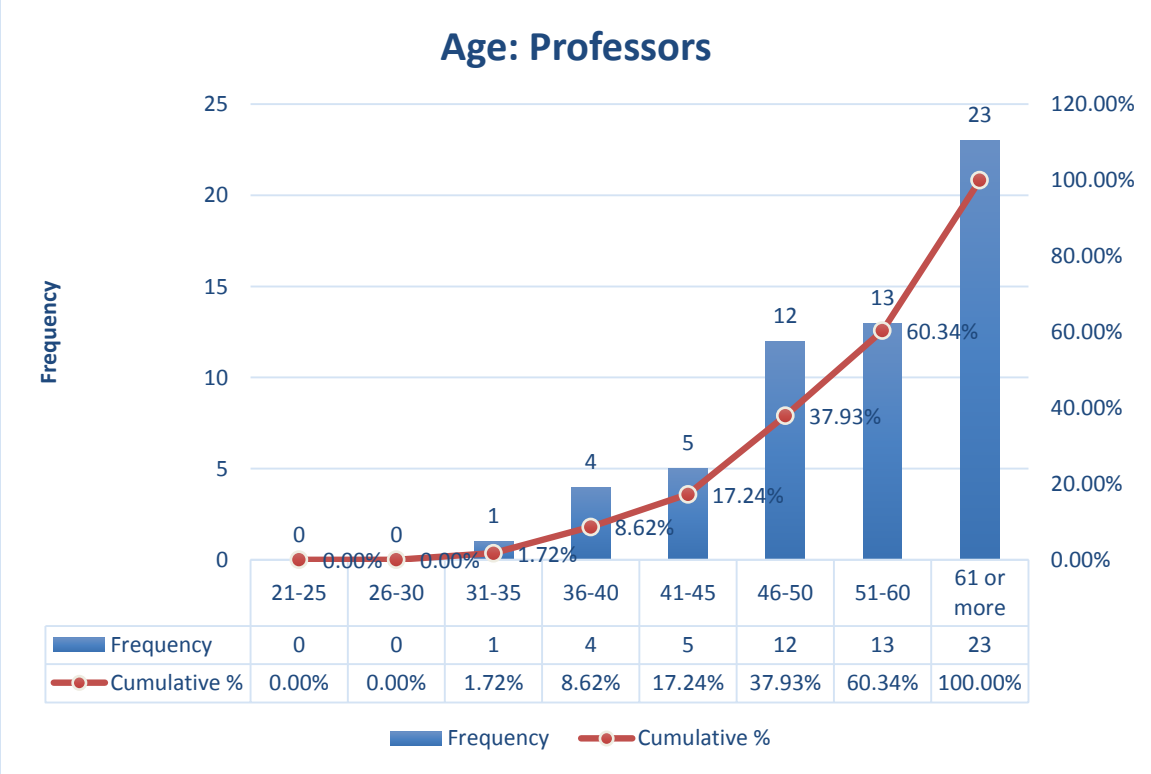


Figure 4-5. Age Distribution of Professors

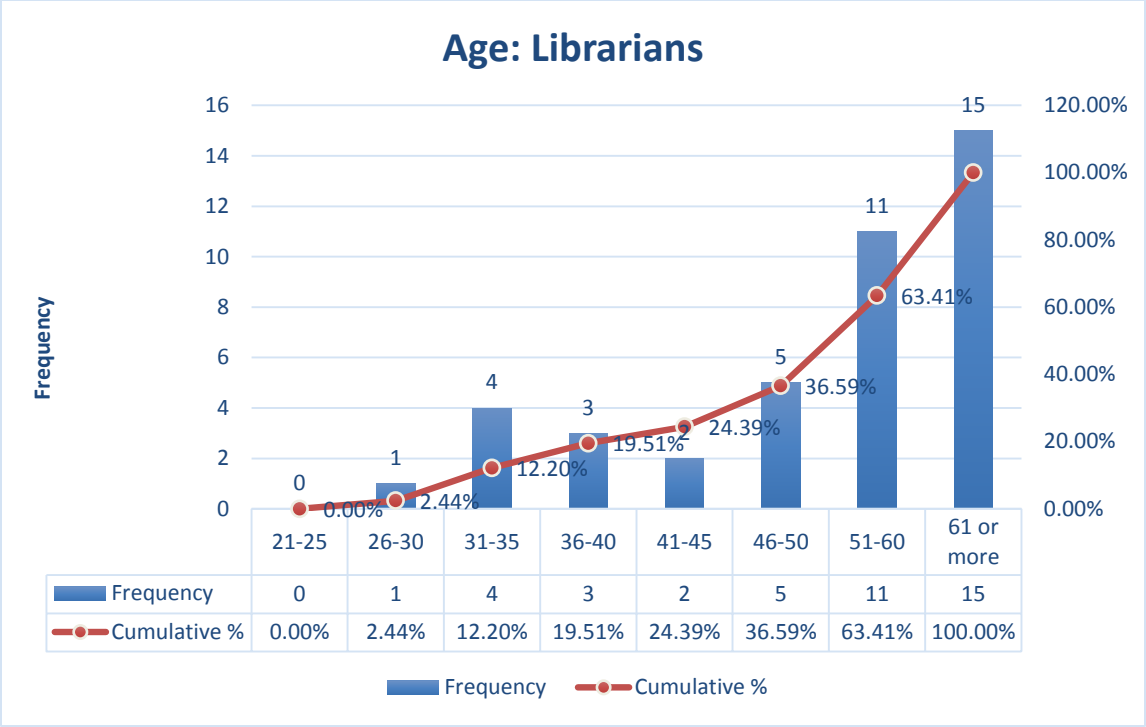


Figure 4-6. Age Distribution of Librarians

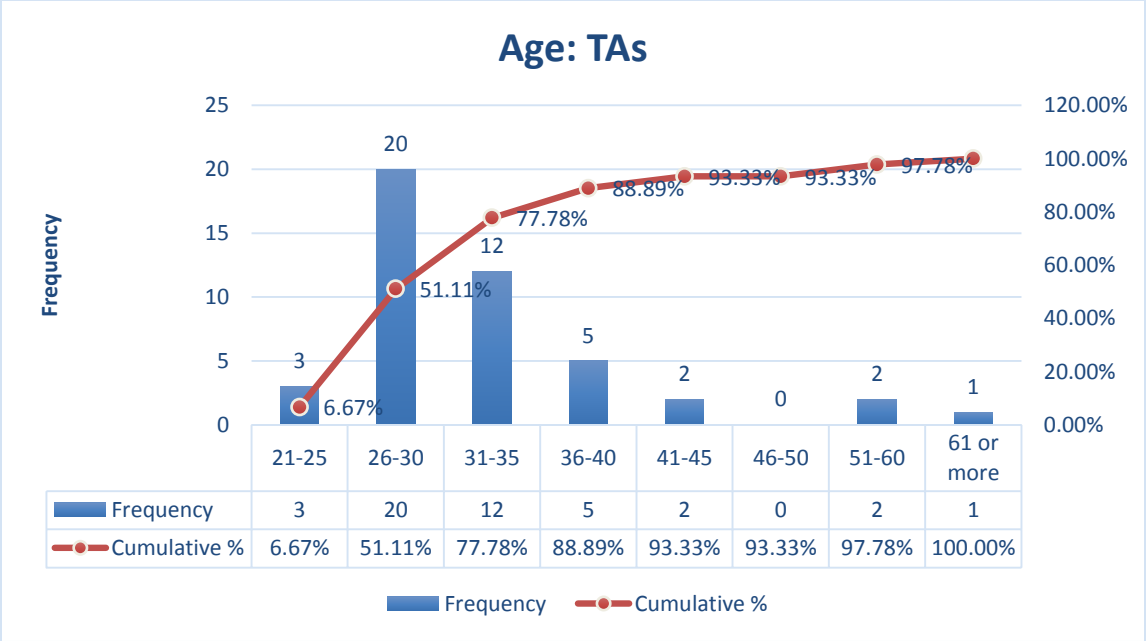


Figure 4-7. Age Distribution of TAs

Findings from Research Questions and Hypotheses

This section discusses data analysis results from four research questions and hypotheses which are involved in past and future literacies for current undergraduate students' education. This study has a fundamental research question, "what does it mean to be an educated person in the digital age?" This key question is linked with a specific research agenda, how educators (professors, librarians, and teaching assistants) consider 'digital research papers' equivalent to 'print research papers' in order to educate undergraduate students who are/will be 'educated' people continued to evolve in the digital age. The data has been collected and combined from an online survey and follow-up personal interviews.

The research findings involve the four main study aims: 1) identify how several independent variables (IVs) are affected on use of MDP (DV1); 2) produce a description of potential differences among professors who themselves publish using multimedia digital formats (MDP professors) compared to professors whose publications are in more traditional text formats (non-MDP professors), especially if this is based on their experience with publishing peer-reviewed MDP articles (DV2) and giving assignments to students using MDP format (DV3); 3) discover professors' evaluation variance of research paper components (especially, content versus visual aids) in both print and digital formats over time; and, lastly, 4) present a thematic analysis of qualitative data analysis using NVivo emerging from open-ended survey questions with 16 in-depth interviews from each group of professors, librarians, and TAs about the meanings of an 'educated person' in the digital age.

Hierarchical multiple regression and binary logistic analysis are the primary analytic procedure used for quantitative data in this study. It is expected that a better overall prediction of use of MDP scores can be obtained by using multiple independent variables. The analysis for this study will be conducted in four phases: 1) bivariate analysis; 2) exploratory factor analysis (EFA) or principal components analysis (PCA) with reliability analysis; 3) hierarchical multiple regression analysis; and, 4) the final step which includes a binary logistic regression. Figure 4-8 depicts this overall model for digital scholarly communication.

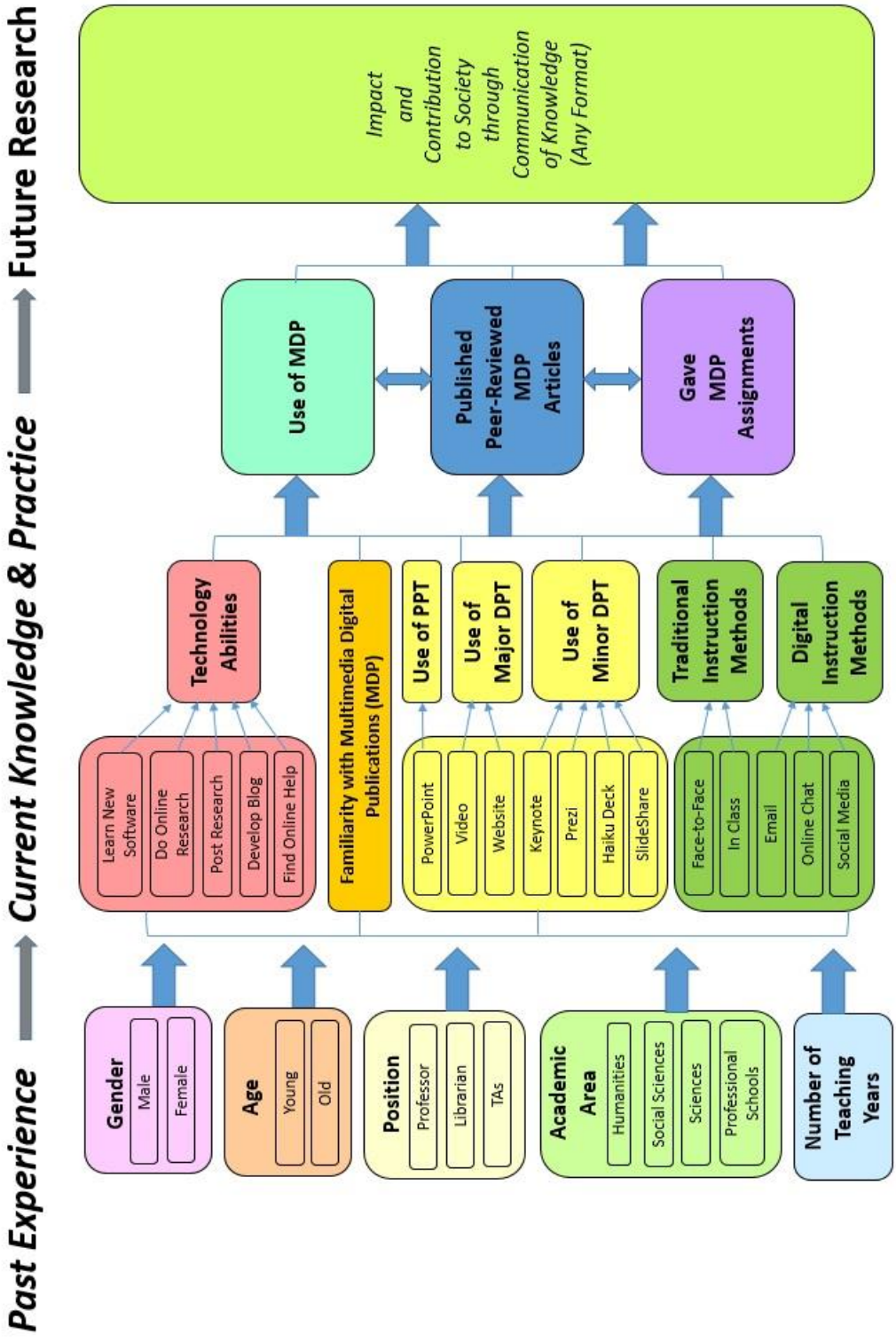


Figure 4-8. Overall Model for Digital Scholarly Communication

Bivariate Analysis I: Zero-order Correlations

An initial examination of zero-order correlations with three dependent variables offers useful insights into the important independent variables. Interpretation of the overall correlations is provided in light of the theoretical model presented in chapter 3 which assisted in mapping the overall model covered by the four research questions and hypotheses. Given the overall correlations, it may be possible to eliminate some variables that appear to have minor effects in order to develop a more parsimonious set for the final analysis. Table 4-4 organized the independent variables according to the major categories of interest that are expected to impact the three dependent variables and this reports on the Pearson correlations of those variables.

In Table 4-4, there are significant correlations between use of MDP and five factors of self-perception of technology abilities. Regarding this category, the factors include learning new software, doing online research, posting and publishing research on the Internet, developing a blog or website, and finding help with a technology problem online. These have positive correlations with use of MDP (r = .164, r = .181, r = .251, r = .219, and r = .189 respectively). Significant and strongly positive correlations exist between the factor of familiarity with MDP and use of MDP (r = .84). Among instruction methods categories, the factor of email instructions is significant and it is positively related to use of MDP (r = .171) but with a low effect size. But, there is the lack of any significant correlation for those independent variables in the demographic and use of DPT categories.

Professors constituted the main group publishing MDP journal articles so only their responses have been analyzed to explore correlations associated with their

demographic information. There are significant and negative correlations with participant's age and number of teaching years (r = -.458 and r = -.397 respectively). In instruction methods categories, in-class instruction and email instruction are negative and also significant (r = -.342 and r = -.353 respectively). The self-perception of the technology abilities' category, familiarity with MDP, and the use of the DPT category do not have significant correlations with experience in publishing MDP journal articles.

The dependent variable of experience in giving assignment to students using MDP format focused on professor's responses since they played a major role in assigning and evaluating students' research papers. The independent variable of use of PowerPoint is significant and negatively correlated with MDP assignments variable (r = -.323). It is assumed that PowerPoint is ubiquitous compared to other DPT and its presence here reflects a negative relationship compared to more traditional research papers. There are no statistically significant correlations for most of independent variables, opposite to the premises that were hypothesized.

Preliminary observations are useful at this stage. Significant correlations exist to support some hypotheses but not all. Also found were negative significant correlations where positive relationships were proposed. What is expected and unexpected will be discussed further with detailed qualitative data in chapter 5.

Table 4-4. Zero-order Correlations of Predictors with three DVs (N=148)

- DV1: Use of Multimedia Digital Publications (MDP) – 11 points Likert scale
- DV2: Published in any peer-reviewed journals using MDP – Binary answer
- DV3: Experienced in giving assignments to students using MDP format – Binary answer

Independent Variable	***All Groups* Correlation with DV1: Use of MDP**	***Professor Group* Correlation with DV2: Published MDP**	***Professor Group* Correlation with DV3: MDP Assignments**
Demographic variable			
Gender	-.126	.202	-.004
Age	-.082	-.458**	.138
Position	.093		
General academic area	.079	.270	-.068
Number of teaching years	-.135	-.397**	.071
Self-perception of technology abilities			
Learn new software	.164*	.192	-.052
Do online research	.181*	.081	-.173
Post and publish research on the Internet	.251**	.235	-.153
Develop a blog or website	.219**	.050	-.120
Find help with a technology problem online	.189*	.218	-.028
Familiarity with MDP	.840**	.263	-.124
Use of DPT			
Use of PowerPoint	.087	.250	-.323*
Use of video (or YouTube)	.037	-.074	-.054
Use of website	.091	-.116	-.261
Use of Keynote	.102	-.156	.121
Use of Prezi	.162	.077	-.035
Use of Haiku Deck	.109	.268	-.140
Use of SlideShare	.087	-.012	.114
Instruction Methods			
Face-to-face (one-to-one)	.142	-.074	.166
In class	.144	-.342*	.094
Email	.171*	-.353**	.103
Online chat	.204	-.070	-.171
Social Media	.025	-.023	-.136

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

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

Exploratory Factor Analysis (EFA) and Principal Components Analysis (PCA)

Both exploratory factor analysis (EFA) and principal components analysis (PCA) are useful methods to help investigators represent a large number of relationships among normally distributed or scale variables in a more parsimonious way. The primary difference between these two analyses is that "EFA is directed at *understanding* the relations among variables by understanding the constructs that underlie them, whereas PCA is simply directed toward enabling one to derive fewer variables the same information that one would obtain from the larger set of variables" (Leech, Barrett, & Morgan, 2011, p. 65). For the category of self-perception of technology abilities, EFA is used for the methods of extracting factors and components that will be used for the next step analysis. Regarding the use of DPT and instruction methods categories, PCA is selected in order to reduce a relatively large number of variables to a smaller number of variables that still capture the same information.

After each EFA and PCA, reliability analysis is also performed to check internal consistency reliability, Cronbach's coefficient alpha. Alpha is typically used when researchers have several Likert-type items that are summed to make a composite score or summated scale. It indicates the consistency of a multiple-item scale.

Exploratory Factor Analysis (EFA) and Reliability Analysis

Self-Perception of Technology Abilities

Exploratory Factor Analysis (EFA)

The initial factor analysis of five self-perception of technology ability items was conducted using principal axis factor analysis. The Bartlett's Test of Sphericity was

statistically significant and the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was 0.82, which falls into the range of being appropriate to use in this study. These values confirm that factor analysis is an appropriate path for conducting further analyses. Meanwhile, the solution was not rotated since only one component was extracted. This means these five self-perception of technology ability items—1) learn new software, 2) do online research, 3) post and publish research on the Internet, 4) develop blog or website, and 5) find help with a technology problem online—are similar variables and can be aggregated as an single variable. Table 4-5 shows communalities of these five items.

Table 4-5. Factor Analysis of Self-Perception of Technology Ability

Communalities

	Initial
1) Learn New Software	.42
2) Do Online Research	.44
3) Post and Publish My Research On the Internet	.46
4) Develop a Blog or Website	.49
5) Find Help with a Technology Problem Online	.53

Reliability Analysis

The self-perception of the technology ability scale's reliability analyses are presented in Table 4-6. The Cronbach's alpha for this scale was 0.82 which indicated that the items provide good internal consistency reliability. All items had moderate to strong item-total correlations ranging from 0.42-0.65, thus all items were retained in subsequent analyses.

Table 4-6. Self-Perception of Technology Ability Scale Reliability Analysis

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.82	.84	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
1) Learn New Software	37.38	55.20	.64	.42	.78
2) Do Online Research	36.32	67.17	.60	.44	.82
3) Post and Publish My Research On the Internet	37.43	52.70	.60	.46	.79
4) Develop a Blog or Website	38.70	42.22	.68	.49	.78
5) Find Help with a Technology Problem Online	37.61	47.94	.71	.53	.75

After the EFA and Reliability Analysis, five self-perception of technology ability items were combined into a single variable to create an aggregate index. It is followed by Torres-Reyna (2016)'s method "(called *naïve* by some) to create indexes out of each cluster of variables" and one new variable for self-perception of technology ability was created for the further analysis with dependent variables. An additive index was constructed to form a new variable as suggested by Torres-Reyna (n.d.). This resulted in self-perception of technology ability = (learn new software + do online research + post and publish my research on the internet + develop a blog or website + find help with a technology problem online) / 5. The divisor here, 5, keeps the new variable consistent with the range of the original scales.

Principal Components Analysis (PCA) and Reliability Analysis

Instruction Methods

Principal Components Analysis (PCA)

Principal axis factor analysis with varimax rotation was conducted to assess the underlying structure for the five items of the instruction methods questionnaire. The rotated component matrix is presented in Table 4-7. The Bartlett's Test of Sphericity was statistically significant and the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was 0.59, which falls into the lower acceptable ranges for such a statistic. These values indicate factor analysis was appropriate to conduct but with a caveat that the inter-correlations assume enough independence to proceed using rotation. With a low cutoff score of 0.5, five instruction methods items loaded onto two factors. After rotation, the first factor accounted for 32.02% of the variance, and the second factor accounted for

31.18%. This analysis identified two factors that explained 63.2% of the variance in the performance measures.

Table 4-7. Factor Analysis of Instruction Methods

Rotated Component Matrix

	Component	
	Traditional	Digital
1) Face-to-Face (One-to-One) Instruction	.84	
2) In Class Instruction	.83	
3) Online Chat Instruction		.86
4) Social Media Instruction		.65
5) Email Instruction		.63

The factor analysis identified strong relationships among items of face-to-face (one-to-one) and in-class instructions. This factor appears to represent traditional instruction methods. The second factor extracted identified items of email, online chat, and social media instructions. This factor appears to represent digital instruction methods. They are relatively new instruction methods and based on current information technology.

Reliability Analysis

To assess whether the data from two variables that were summed to create the traditional instructions score formed a reliable scale, Cronbach's alpha was computed. The alpha for the four items was .63, which indicated that the items come from a scale that has minimally adequate consistency reliability. The traditional instruction methods scale reliability analysis result is presented in Table 4-8.

Table 4-8. Traditional Instruction Methods Scale Reliability Analysis

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.621	.625	2

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
1) Face-to-Face (One-to-One) Instruction	9.39	7.20	.45	.21	.
2) In Class Instruction	8.79	9.55	.45	.21	.

Cronbach's alpha for the three items, email, online chat, and social media instructions, was 0.56, which indicated minimally adequate consistency reliability. The digital instruction methods' scale reliability analysis result is presented in Table 4-9.

Table 4-9. Digital Instruction Methods Scale Reliability Analysis

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.56	.56	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
1) Email Instruction	5.92	22.47	.38	.16	.45
2) Online Chat Instruction	10.18	19.95	.44	.20	.34
3) Social Media Instruction	11.45	28.56	.30	.10	.55

The clustered items were combined into a single variable to create an index to be used in additional analyses (Torres-Reyna, n.d.). It is recognized that this exploration is tenuous given the weak findings which emerged in the above analyses. Rotation of the component matrix can yield more viable results. Two additive indexes were created to form two new variables as a composite representation of those variables found to be similar using the above analyses (Torres-Reyna, n.d.). The new variables were created consistent with the range of their original scales.

- traditional instruction methods = (face-to-face instruction + in class instruction) /2
- digital instruction methods = (email instruction + online chat instruction + social media instruction) /3

Use of Digital Presentation Tools (DPT)

Principal Components Analysis (PCA)

Principal components analysis with varimax rotation was conducted to assess how seven DPT variables cluster. The rotated component matrix is presented in Table 4-10. The Bartlett's Test of Sphericity was statistically significant and the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was 0.60, which indicates factor analysis was appropriate to conduct but still weak given these results. With a cutoff score of 0.5, seven DPT items loaded onto three factors. This analysis identified three factors that explained 66.68% of the (internal) variance in the performance measures.

Table 4-10. Principal Components Analysis of Use of DPT

Rotated Component Matrix[a]

	Component		
	Minor DPT	Major DPT	PowerPoint
1) Haiku Deck	.82		
2) SlideShare	.68		
3) Prezi	.65		
4) Keynote	.64		
5) Video (or YouTube)		.87	
6) Website		.87	
7) PowerPoint			.89

The most explanatory factor identified in the principal components analysis included items of Haiku Deck, SlideShare, Prezi, and Keynote. This factor appears to

represent minor DPT. These are particular DPT used by relatively few people in academic areas. The second factor extracted identified items of video (or YouTube) and website. These two are major DPT when MDP are presented on the Internet. The third factor extracted item was PowerPoint.

Reliability Analysis

Cronbach's alpha was computed to assess whether the data from four variables that were summed to create the minor DPT score formed a reliable scale. The minor DPT scale reliability analysis result is presented in Table 4-11. The alpha for the four items was .60, which indicated that the items form a scale that has minimally adequate consistency reliability.

Table 4-11. Minor DPT Scale Reliability Analysis

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.60	.66	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
1) Haiku Deck	6.25	28.47	.54	.34	.50
2) SlideShare	5.82	26.72	.35	.26	.55
3) Prezi	5.41	21.64	.42	.18	.49
4) Keynote	4.97	18.76	.36	.20	.58

Meanwhile, Cronbach's alpha for the two items, video (YouTube) and website, was 0.70, which indicated that the items form a scale that has reasonable internal consistency reliability. The major DPT scale reliability analysis result is presented in Table 4-12.

Table 4-12. Major DPT Scale Reliability Analysis

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.70	.70	2

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
1) Video (or YouTube)	8.31	11.83	.54	.29	.
2) Website	6.57	13.07	.54	.29	.

The clustered items were combined into a single variable to create an index to measure for the additional analysis with independent variables (Torres-Reyna, n.d.). The additive index created one new variable as explained above (Torres-Reyna, n.d.):

- minor DPT = (Haiku Deck + SlideShare + Prezi + Keynote) / 4
- major DPT = (Video + Website) / 2

Finding from Research Question 1: Use of Multimedia Digital Publications (MDP)

Bivariate Analysis II: Zero-order Correlations after EFA and PCA

After the EFA and PCA were followed by reliability analysis, a second examination of zero-order correlations using clustered independent variables with use of MDP suggested useful insights into the next analysis. Table 4-13 presents correlations between each combined score (IVs) and use of MDP (DV). Each factor score (IVs) and use of MDP (DB) is also displayed as a guide.

Table 4-13. Zero-order Correlations of Predictors with Use of MDP after EFA and PCA (N=148)

DV1: Use of Multimedia Digital Publications (MDP) – 11 points Likert scale

Independent Variable	Correlation: Combined Score (Torres-Reyna, 2016) with Use of MDP	Correlation: Factor Score with Use of MDP
Self-perception of technology abilities	.26**	.26**
Use of Major DPT	.08	.09
Use of Minor DPT	.18*	.04
Traditional Instruction Methods	.17*	.14
Digital Instruction Methods	.18*	.16

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

On a basis of Torres-Reyna's (2016) creation indexes out of each cluster of variables, in Table 4-13, there are significant correlations between use of MDP and four of the major factors in the research model. The factors of self-perception of technology abilities, use of minor DPT, traditional instruction methods, and digital instruction methods have positive correlations with use of MDP (r = .26, r = .18, r = .17, and r = .18

respectively). Use of PowerPoint and major DPT were not significantly related to use of MDP (r = .09 and r = .08 respectively).

Hierarchical Multiple Regression Analysis

Use of Multimedia Digital Publications (MDP)

Initially, there were 23 independent variables including demographics in this exploratory, hypothesis seeking investigation. Table 4-4 identified some independent variables that were possibly impacting the three dependent variables. Then, after the EFA and PCA with reliability analysis, six clustered independent variables were extracted. In the first step of the regression, the analysis was limited to the expected best predictors based on the theoretical model and the preliminary correlation analysis. The results are presented in Table 4-14 and 4-15. Additional predictors are then brought into hierarchical multiple regressions and the respective *t*-values and R^2_{inc} values are evaluated to determine how they contribute to the overall model (Table 4-14). Adding variables to the regression equation that do not explain use of MDP will reduce the values for adjusted R^2 and the standard error of residuals by reducing the degrees of freedom.

Prior to undertaking the regression analysis, preliminary data screening was conducted. Histograms for each independent and dependent variable indicated that the univariate distributions were reasonably normal and that there were no extreme outliers. Scatter plots between every pair of variables revealed linear relationships and in most cases no extreme bivariate outliers. Yet, the data from one participant revealed bivariate outliers with respect to familiarity with MDP and use of minor DPT when the boxplots displayed. The data were self-contradictory indicating familiarity with DPT but no

knowledge of those products. Thus, this one outlier case was not included in the regression analysis, resulting in a sample for analysis of 147 participants.

In this study, the first research question is to understand how well use of MDP can be predicted by the complete set of independent variables and how much variance is predicted uniquely by each independent variable when the contributions of other predictor variables are statistically controlled. In hierarchical multiple regression (Leech, Barrett, & Morgan, 2011; Warner, 2013), the independent variables are entered into the analysis in a series of blocks or groups, each block containing one or more variables. In each step, the effect size that describes the unique contribution of each variable is adjusted to partial out or control for any linear association of this variable with predictor variables that have been entered previously. The order of entry is determined based on the theoretical model and the results from exploratory analysis. In this study, the self-perception of technology abilities is considered a control and entered first. As illustrated in Table 4-14, the self-perception of technology abilities and predictors for use of minor DPT, digital instruction methods, traditional instruction methods, and familiarity with MDP are entered as separate models into the hierarchical multiple linear regression.

In SPSS, zero-order, partial, and part correlations are asked for each independent variable (IV) with a dependent variable (DV) representing use of MDP. Partial correlation is the relationship between the DV and an IV when the relationship between the DV and other IVs has been removed or partialed out from the variance of both the IV and the DV. Part correlation represents the portion of the total variance in the DV which is contributed by the IV. The square of part correlation is the amount of change attributed to R^2 by including this variable. The standard error of residuals is the standard deviation

of the DV about the regression plane. The residuals can be other factors, apart from the variable under consideration, that are influencing use of MDP. In the regression analysis, residuals should be reasonably small because they represent the part of use of MDP which is not predicted by the independent variables.

In Table 4-14, the null hypothesis for each model states that the change in R^2 (contribution of this block to the variance in the DV) is zero when the variable is first entered into the regression (H0: $R^2_{inc} = 0$). The Baseline model (Model 1) introduces the control variable in the regression. From Model 2 to Model 5 it includes the direct effects of the independent variables. For the overall model, the F value is examined for the final step in the hierarchical multiple regression analysis. If *p* is less than the predetermined alpha level (here, $p \leq .05$), the overall regression is considered significant.

For the results, hierarchical multiple regression analysis was performed in which each of the major predictors was entered in a single block. Table 4-14 provides a summary of R^2 and R^2 changes for each step in the hierarchical multiple regression.

Table 4-14. Model Summary of R^2 and R^2 Changes (N= 147)

Predictors Included	R for Model	R^2 for Model	Adjusted R^2	F for Model	R^2 Change	F for R^2 Change
Model 1: Self-Perception of Technology Abilities (SPTA)	.266	.071	.064	F(1,129)=9.82**	.071	F(1,129)=9.82**
Model 2: SPTA, Use of Minor DPT	.300	.090	.076	F(2,128)=6.35**	.020	F(1,128)=2.75
Model 3: SPTA, Use of Minor DPT, Digital Instructions	.339	.115	.094	F(3,127)=5.49***	.025	F(1,127)=3.53
Model 4: SPTA, Use of Minor DPT, Digital Instructions, Traditional Instructions	.345	.119	.091	F(4,126)=4.24**	.004	F(1,126)=.56
Model 5: SPTA, Use of Minor DPT, Digital Instructions, Traditional Instructions, Familiarity with MDP	.848	.719	.708	F(5,125)=63.91***	.600	F(1,125)=266.78***

**p < .05, **p < .01, ***p < .001*

Note: p-values are included in the next table with t-values.

The overall regression, including the one with a control variable and four predictor variables, was statistically significant, $R = .85$, $R^2 = .72$, adjusted $R^2 = .71$, $F(5,125) = 63.91$, (Table 4-14, Model 5). The R^2 value indicates how much variance in the dependent variable can be explained by variation in the independent variables. The probability values for variables in the equation are provided in a later table. The overall model (Model 5) indicates 72% of the variation in educators' use of MDP can be explained by the control and the four predictor variables. After controlling for the self-perception of technology abilities, the three predictor variables—use of minor DPT, digital instruction methods, and traditional instruction methods—contribute almost equally to the variance in use of MDP. The last predictor variable, familiarity with MDP, was the most dominant variable that contributes significantly to predicting use of MDP.

To assess the contributions of individual predictors, the *t* ratios for the individual regression slopes were examined for each variable in the step in which it was first introduced into the analysis. According to Field (2005), "The *F*-ratio is a measure of the ratio of the variation explained by the model and the variation explained by unsystematic factors" (p. 323). When a variable produced little or no increase in R^2, the *F*-value may go down because of the loss of degrees of freedom. The *t*-values of the five best predictors are presented in Table 4-15.

In the first step (Model 1), the self-perception of technology abilities (SPTA) was statistically significant, $t(129) = 3.13$, $R^2_{inc} = .071$. The relationship of SPTA to use of MDP is positive and was expected. For Model 2, use of minor DPT had a positive relationship to use of MDP as predicted in the research model, but not significant, $t(128) = 1.66$, $R^2_{inc} = .020$. In Model 3, digital instruction methods did not have a statistically

significant correlation with the use of MDP, *t* (127) = 1.88, R^2_{inc} = .025. For Model 4, traditional instruction methods also did not have a statistically significant correlation with the use of MDP, *t* (126) = .75, R^2_{inc} = .004. In Model 5, the familiarity with MDP had a significant and positive relationship to use of MDP, *t* (125) = 16.33, p < .001, R^2_{inc} = .719. All of independent variables are positively related to use of MDP as indicated in the research model. In Table 4-15, the regression coefficient reported the size of the effect of use of MDP for each predictor variable. From the results in Table 4-14 and 4-15, we can assume that educators' use of MDP can be reasonably predicted from these five variables.

Table 4-15. *t*-values for the Five Best Individual Predictors (N=147)

Independent Variable	Unstandardized Coefficients	Standardized Coefficients	*t*-Value	*p*-Value	$R^2_{increment}$	R^2
Self-Perception of Technology Abilities (Model 1)	.54	.27	*t* (129)=3.13	.002**	.071	.071
Use of Minor DPT (Model 2)	.33	.14	*t* (128)=1.66	.10	.020	.090
Digital Instruction Methods (Model 3)	.26	.16	*t* (127)=1.88	.06	.025	.115
Traditional Instruction Methods (Model 4)	.10	.07	*t* (126)=.75	.46	.004	.119
Familiarity with MDP (Model 5)	.94	.83	*t*(125)=16.33	.000***	.600	.719

**p < .05, **p < .01, ***p < .001*

Finding from Research Question 2: Published MDP and MDP Assignments

Binary Logistic Regression (BLR)

Comparison of Two Professor Groups with Two Dependent Variables

Logistic regression was conducted to assess how professors who themselves publish using multimedia digital formats (MDP professors) compare to professors whose publications are in more traditional text formats (non-MDP professors).

In Binary Logistic Regression (BLR) the outcome variable is dichotomous, allowing the researcher to predict membership in a target group. In the first phase, the target groups are identified as the MDP professors and the non-MDP professors. A BLR was performed to see if a model could correctly classify or predict which professors published using MDP. The outcome variable was coded as follows: 0 = non-MDP and 1 = MDP.

In the second phase, the target groups are the MDP format assignments and the non-MDP format assignments. A BLR was used to assess if those professors who publish using MDP formats could predict the format of assignments given to their students. The professor groups were distinguished by MDP or non-MDP professors. The outcome variable was coded as follows: 0 = non-MDP format assignments and 1 = MDP format assignments.

Phase I: Published in Any Peer-Reviewed Journals using MDP

Binary logistic regression (BRL) was conducted to assess whether the predictor variables significantly predicted whether a professors published in multimedia digital publications (MDP) or not. The selection of the predictor independent variables were

specified by the theoretical model and from the results of the exploratory analyses. In this BLR, four independent variables are included: three continuous variables (age, number of teaching years, and use of MDP) and one categorical variable (academic areas). The categorical variable, academic areas, is dichotomized and coded as follows: 1 = sciences, 0 = other academic areas (humanities, social sciences, and professional schools).

When all four predictor variables are considered together, they significantly predict whether or not a professor published in any journals using multimedia digital format, $x^2 = 22.13$, $df = 4$, $N = 50$, $p < .001$. The Cox and Snell R^2 of .358 and the Nagelkerke R^2 of .549 indicate a moderate association between publishing MDP and the four predictor variables.

In Table 4-16 reported the percentage of professors' publishing MDP correctly classified as published in any journals using MDP format as 63.6%; the percentage of professors' publishing MDP correctly classified as not published in any MDP was 97.4%. The overall correct percentage was 90%.

Table 4-16. Classification Table for Professors' Publishing MDP/Non-MDP (N=50)

Classification Table[a]

			Predicted		
			Professors' Publishing MDP		Percentage Correct
	Observed		Non-MDP	MDP	
Step 1	Professors' Publishing MDP	Non-MDP	38	1	97.4
		MDP	4	7	63.6
	Overall Percentage				90.0

a. The cut value is .500

Among the four variables entered in the logistic regression, the two variables with significant coefficients were an age and academic areas, in particular science area. In Table 4-17, the binary logistic model for predicting professors' publishing MDP from four variables is presented.

Table 4-17. Model Summary for Binary Logistic Regression to Predict Publishing Multimedia Digital Publications (MDP) (N = 50)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1	**Age**	**-1.439**	**.680**	**4.474**	**1**	**.034**	**.237**	**.062**	**.900**
	Teaching Years	.014	.067	.043	1	.836	1.014	.890	1.155
	Science Area	**3.067**	**1.255**	**5.973**	**1**	**.015**	**21.486**	**1.836**	**251.462**
	Use of MDP	-.177	.157	1.262	1	.261	.838	.616	1.141
	Constant	6.950	3.582	3.766	1	.052	1043.440		

The Exp(B) gives the odds ratios for each variable (Leech, Barrett, & Morgan, 2011). Thus, the Exp(B) indicates, for each one unit change in the predictor variable, how much change can be predicted in the odds of a professor being published multimedia digital publications (MDP).

In this logistic regression model, the Exp(B) for age was .237. Since Exp(B) is less than one for age, the odds of being published MDP decrease as the score for age increases. That means older professors tend to not publish using MDP compared to younger professors.

The Exp(B) for science areas was 21.486 indicating that for a one point increase in science areas, the predicted odds of a professor being published MDP were almost 22 times greater. This means professors in science areas tend to publish more in MDP than other areas such as humanities, social sciences, and professional schools.

Phase II: Experienced in Giving Assignments to Students using MDP formats

Binary Logistic regression (BLR) was conducted to assess whether the experience in publishing any journals using MDP (predictor, IV) significantly predicted whether or not giving assignments to students using MDP format (DV). In this BLR, both the independent and dependent variables are dichotomous. When the predictor variable is considered, the model does not significantly discriminate based on whether or not a professor gave students assignments using MDP format, $x^2 = 2.28$, $df = 1$, $N = 53$, $p > .05$. The Cox and Snell R^2 of .042 and the Nagelkerke R^2 of .056 indicate a very week association between publishing MDP and giving MDP format assignments.

Table 4-18 reported the percentage of professors' giving MDP format assignments. The model was unable to classify correctly those who were experienced with MDP formats. The percent correctly classified as experienced was 28.6%; the percentage of professors' giving MDP format assignments correctly classified as not experienced was 88%. The overall correct percentage was 56.6%. This model does not describe the relationship between MDP experience and assigning students to use MDP formats.

Table 4-18. Classification Table for Professors' Giving Multimedia Digital Publication (MDP) Format Assignments (N=53)

Classification Table[a]

Observed			Predicted		
			Experienced in giving assignments to students using MDP format		Percentage Correct
			Yes	No	
Step 1	Experienced in giving assignments to students using MDP format	Yes	8	20	28.6
		No	3	22	88.0
	Overall Percentage				56.6

a. The cut value is .500

There was no significant coefficient between the predictor and the dependent variable. In Table 4-19, the binary logistic model for predicting professors' giving assignments to students using multimedia digital publication format is presented.

Table 4-19. Model Summary for Binary Logistic Regression to Predict Professors' Giving MDP Format Assignments (N = 53)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	Professors who published MDP	1.076	.744	2.091	1	.148	2.933	.682	12.612
	Constant	-.981	.677	2.099	1	.147	.375		

a. Variable(s) entered on step 1: Professors.

Finding from Research Question 3: Professors' Assessment of Research Papers over Time

Since the advent of research papers in academia, professors have played the major role in assigning and evaluating students' research papers. Survey data from 60 professors were examined in order to reveal how they identify essential components of research papers in both print and digital formats to educate undergraduate students. The survey questionnaire for this research question was "how important are the following components when constructing a print / digital research paper [*]?" There were four parts associated with this time frame [*]:

- Part 1. when you were an undergraduate student
- Part 2. when you were a graduate student
- Part 3. now when you evaluate research papers as a professor
- Part 4. in the next five years

There are nine essential components of research papers: 1) topic, 2) content, 3) organization, 4) clarity and style, 5) visual Aids, 6) number of references, 7) length, 8) timely submission, and 9) ethics. In particular, the components *content and references* and *visual aids* were selected for the comparison over time. In academics, *content and references* are considered as the most crucial component when constructing research papers—even in a changing multimedia digital era. For a comparison, *visual aids* were examined in order to see whether professors' perceptions have changed over time when they evaluate students' research papers. Among the nine components of research papers, *visual aids* is most affected by the format of research papers. In print research papers,

visual aids are graphs, images, and pictures. In digital research papers, visual aids include not only graphs, images, pictures but also moving images, flash files, audios, and videos.

Difference Score between Print and Digital Research Papers Over Time

The table 4-20 shows the mean of difference score between print and digital research papers over time. This is responded to on an 11-point Likert-scale. A score of one is least important and a score of ten is most important. For instance, suppose a professor responds to the importance of content. He or she checked the number '10' on print research paper and put the number '7' on digital research paper, then the difference score between print and digital research papers on content becomes '3'. In the next place, in order to see any changes on research papers, each difference score was calculated to produce respective averages according to four academic areas and also compare over the four time frames.

Table 4-20. Professors' Assessment over Time of Difference Score Mean between Print and Digital Research Paper by Over Time (N=60 professors)

Time	Academic Area	Content	References	*Content + References*	*Visual Aids*
Undergraduate	**Humanities**	8.43	7.03	15.47	2.87
	Social Sciences	7.50	5.64	13.14	1.91
	Sciences	7.77	4.43	12.20	5.43
	Professional	6.38	2.63	9.00	3.25
Graduate	**Humanities**	8.60	7.77	16.37	4.71
	Social	9.75	7.25	17.00	5.92
	Sciences	7.58	4.06	11.63	6.49
	Professional	7.13	5.00	12.13	5.00
Current	**Humanities**	1.27	1.44	2.71	-1.08
	Social	1.93	1.11	3.05	-1.10
	Sciences	0.33	0.43	0.76	0.14
	Professional	0.38	1.25	1.63	-1.13
Next 5 Years	**Humanities**	0.61	0.14	0.76	-0.77
	Social	1.57	1.86	3.43	-0.57
	Sciences	0.00	0.50	0.50	-0.20
	Professional	0.13	-0.50	-0.38	-1.00

Difference Score on Content and Reference over Time

Each difference score on *content and reference* over time is reported in Table 4-21 and its graphic display in Figure 4-9.

Table 4-21. Professors' Assessment over Time of Difference Score between Print and Digital Research Paper based on Content and References

Content + References	Undergraduate	Graduate	Current	Next 5 Years
Humanities	15.47	16.37	2.71	0.76
Social Sciences	13.14	17.00	3.05	3.43
Sciences	12.20	11.63	0.76	0.50
Professional Schools	9.00	12.13	1.63	-0.38

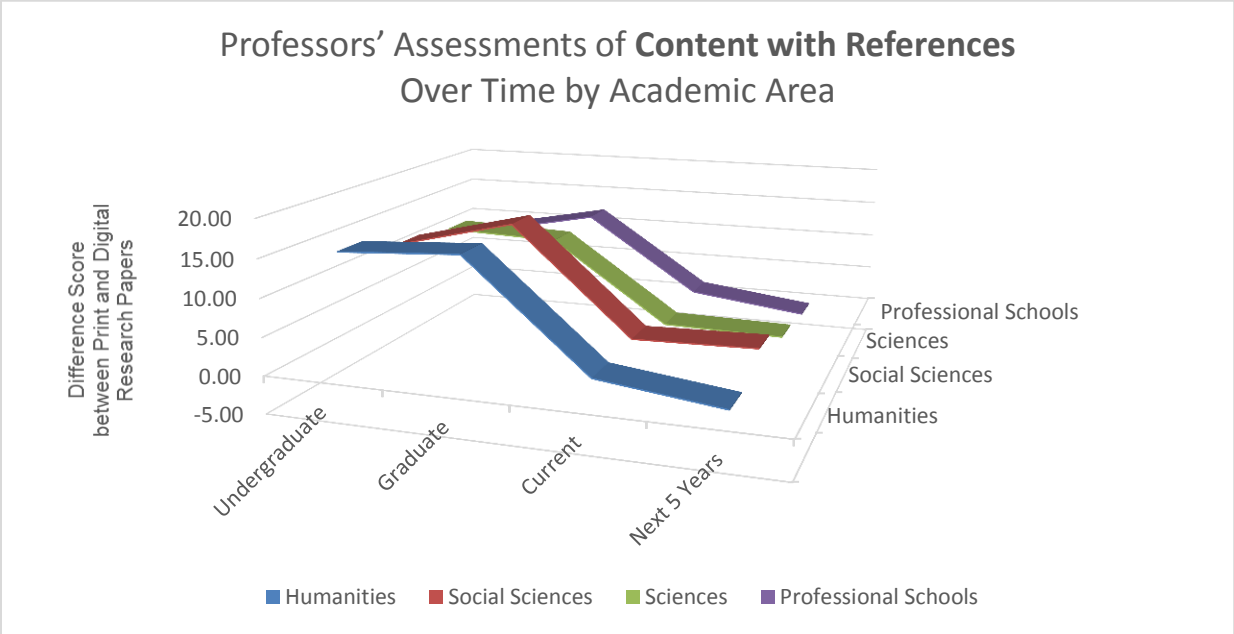


Figure 4-9. Professors' Assessment over Time of Difference Score between Print and Digital Research Paper based on Content and References

The Table 4-21 and Figure 4-9 reports professors' assessment of *content and references* over time by four academic area. The numbers provided in the table 4-21

represent the difference scores between print and digital research papers. Figure 4-8 graphically shows that difference scores decrease over time.

Difference Score on Visual Aids over Time

In Table 4-22 and Figure 4-10 shows difference score on *visual aids* over time.

Table 4-22. Professors' Assessment over Time of Difference Score between Print and Digital Research Paper based on Visual Aids

Visual Aids	Undergraduate	Graduate	Current	Next 5 Years
Humanities	2.87	4.71	-1.08	-0.77
Social Sciences	1.91	5.92	-1.10	-0.57
Sciences	5.43	6.49	0.14	-0.20
Professional Schools	3.25	5.00	-1.13	-1.00

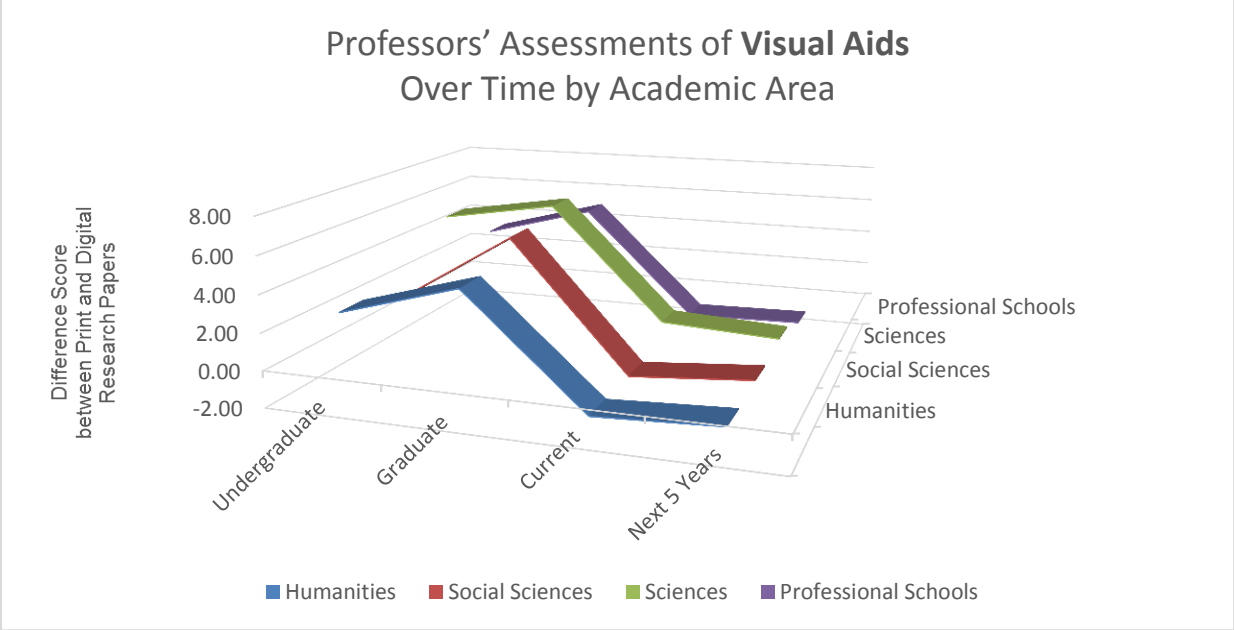


Figure 4-10. Professors' Assessment over Time of Difference Score between Print and Digital Research Paper based on Visual Aids

Table 4-22 and Figure 4-10 present professors' assessment of *visual aids* over time by the four academic areas. Likewise, the difference score decreases over time. Even the minus score on *visual aids* indicates that *visual aids* are considered as more important components in digital research papers than in print research papers when professors evaluate students' research papers. Professors from all of four areas responded that in the next five years that *visual aids* will be considered as more important components for evaluation of research papers using digital format than for print format.

Finding from Research Question 4: Definition of Educated Person

Thematic Analysis of Definition of Educated Person

This is a thematic analysis of words used by the position of the respondent at a major research university for three groups of individuals: 1) professors, 2) librarians, and 3) teaching assistants (TAs) by four general academic areas: 1) humanities, 2) social sciences, 3) sciences, and 4) professional schools. The total number of respondent is N = 164. The data has been collected and combined from both an online survey and follow-up personal interviews.

The question was "what does it mean to be an 'educated person' in multimedia digital age?" In Table 4-23, 4-24, and 4-25 show the survey answers from each group: professors, librarians, and TAs. These are the survey responses and do not include interview transcriptions.

Table 4-23. The Open-Ended Survey Answers from Professors

What does it mean to be an educated person?
A well educated person reads, or obtains knowledge, from a wide range of sources, print, digital, verbal. They keep current on past and present issues and have a broad understanding of the many topics that they will encounter in life. For example, a pointy headed scientist like myself should read and keep current on philosophy, science, religion, politics, economics, art, history, etc.. Lifelong learning is essential to an attempt to understand the all the great mysteries and wonder of life.
Knowing how to think and knowing how to find information; knowing about one's feelings; having some broad sense of the world at large; being able to be empathetic.
Someone who has understood what they have studied
ability to analyze, react and communicate based on the experience of mankind not just the personal one
An educated person has the ability to think independently and critically as well as be able to communicate their ideas clearly orally, in written content, as well as digitally.
to have both a set of accumulated knowledge and to have the tools, and engaged curiosity, to learn more

primarily measured by formal education. being able to think rationally and objectively someone who can use existing software and master new software relatively easily
An educated person is one who knows how to find and evaluate information and synthesize new ideas based on the information.
A person that is curious about a wide variety of subjects, read widely, is a skeptic and uses scientific thinking and humanistic values to evaluate the information in the world and is able to put news and facts into large, broad contexts, even when not an expert on the exact topic.
person who is able to carry out the task at hand with aplomb and efficiency / person who has general knowledge often lacking in our students today
Widely read, intellectually curious, experience in educational settings
To know how to gain and use information wisely
Having knowledge and ability to analyze.
Someone who has had a significant amount of formal education.
To be able determine whether or not you can express an informed opinion on a topic.
In my opinion, a person who has high moral standard is an educated person.
To be acquainted with recent development in his specific field of "education" and able to retrieve and follow the ongoing discussion.
I guess to take advantage of all the possible information channels especially all sort of digital ones. Of course their use must be accompanied by a good mind and an ethic behavior.
In the academic sense, it is someone who understands his/her field of study, knowledgeable about the changes taking place in the field, uses his/her knowledge and skills to help others, fair and ethical about use of his/her knowledge in his/her particular field, etc.
To be familiar with the cultural history, literature, arts and sciences of one's society and times / / To have the knowledge and skills to thrive in and to contribute to the development of society / / To have integrated one's knowledge beyond the accumulation of facts to reach a level of understanding / / To have benefited from the knowledge of others to achieve learning for oneself, and to have developed the skills to plan future learning, knowledge-building, and insight
To be curious.
someone who is literate, analytical, probing, questioning, etc.
Knowing how to ask questions and where to find data. Love of learning is needed to be an educated person.
To be aware of the world around us as well as of our own disciplines, to be engaged in and have the skills for improving conditions on a local and global level.
It means that one has a liberal arts education with a grounding in basic science and math, humanities, culture and literature, and robust understanding of politics and questions of democracy.
To be able to develop a framework through which you can analyze material, particularly media created material, and find the relevant information to understand and hopefully contribute to a positive resolution of the issues facing yourself, your community and the larger society
To me, that sounds like a philosophical question, not a survey question.
A person who has an in-depth background in history, math, language, and social studies. An educated person keeps up to date on current events, advances in science and social sciences,

and engages in life-long learning.
To be generally well read in the humanities, sciences, and the arts. / To have a well rounded understanding of cultural, political, and social history, global and local. / To have the ability to find and evaluate information relevant to all aspects of one's career, personal life, and aspirations.
to be aware of progress in the sciences, arts and understanding of cultures, and to be willing to learn more about each of these areas and to consider them in the context of history
Someone who can formulate one's opinion on the world based on critical thinking
Being competent in comprehension and analysis / Being considerate of others
To have a broad background in the humanities and science to better cope with life's challenges
One who is well read ACROSS the arts, humanities, sciences, and social sciences
You know how to think about and interpret information logically. For a scientist to understand the scientific method and scientific inference.
There are different branches; knowledge, understanding and wisdom (taken from Jewish traditional sources). / 1. knowledge is knowing facts, you need to know at least some facts on the subject. / 2. understanding is the ability to make connections between different ideas. For example, you could have photographic memory and know a lot of facts (i.e., knowledge) but still be incapable of deducing new ideas--i.e., think "rain man" in the extreme. / 3. wisdom is a higher level of understanding that places things in perspective and believes that that this universe we live in has meaning. / / To be a well-rounded educated person I think you need all 3. From my perspective of teaching the most important education skill to develop is critical thinking.
Someone who has been taught by another person for several years.
An individual who is balanced, who can think out without biases, always willing to go extra mile to educate and train fellow individuals and humble.
An educated person is someone who has knowledge of current events, social norms and customs, and is generally knowledgeable about the world around them.
To be a continually growing, information seeking person--curious and eager to gain in-depth knowledge about the world.
To have specific and detailed knowledge about a topic or topics
to go through learning and acquire new knowledge
To be able to think critically
Knowledgeable on a broad range of topics at a surface level but able to do research/learn as needed to understand a topic in greater detail, ability to think independently and to question dogma, able to argue ones point coherently and logically
Someone who is knowledgeable and can learn new things and adapt to novel technology quickly.
To be educated implies having enough experience and knowledge not necessarily to know everything in your field of interest, but to know where and to what resources to go to find reliable answers to questions and to find further questions from those answers.
Well read. Good writer. Articulate. Open minded. Tolerant.
An educated person is aware of the thinking and history of the human race and the workings of the physical world. An educated person can connect pieces of their knowlege base to better

understand their world, to deepen their own understanding and questions that they research as well as the communication of others as expressed in discussion or written format.
Inquisitive

Table 4-24. The Open-Ended Survey Answers from Librarians

What does it mean to be an educated person?
An educated person has undertaken a course of instruction, usually in a formal sense of schooling. While life experience is important, it is not a substitute for receiving instruction from a subject expert. An educated person will be able to apply knowledge gained in one area to other scenarios.
Having the ability to tell truth from fiction. Being able to use information to make new judgments.
Know where to look for quality information when I have a question to answer or need information; to understand the ethics of information; and to be aware of resources available for seeking information. general knowledge of the world and an appreciation for continuously seeking knowledge.
A wide knowledge & a critical mind.
Someone conversant with history, the sciences, current events--at least at a general level. And someone able to think critically--to evaluate print and digital resources.
Complex question! would take more than 20 minutes for sure... only thought would be to make a distinction between formal education and self-educated
Anyone has graduated from a higher education institution.
Formal education: graduate degrees / Well read, aware of current events
Someone who has completed a prescribed course of instruction.
An educated person typically has a college degree, is inquisitive, and continues to seek out opportunities for learning beyond college. An educated person does not form judgements without gathering facts and weighing evidence, and exhibits tolerance and courtesy regarding others' opinions.
Having enough broad learning to be able to assess new topics and learn new material independently.
The definition of educated person will be expanded. One aspect that will grow in importance is visual literacy. The students will need to cultivate the ability not only to express, but also to understand the scope of the messages delivered in digital/multimedia formats.
A person who consistently strives to learn about and impact the world around him/her
An educated person is sufficiently well informed to follow current cultural, scientific, and public affairs in print and media and to often form independent judgments about them in print and voice.
Someone who is always in a learning mode, has curiosity to grow and learn.
A person who can objectively process information.
Ability and willingness to learn

To know how little one knows.
Being an educated person means that you think critically, that you have been exposed to a wide variety of ideas, philosophies and attitudes from within and without your own culture. It also means that you are able to ask questions, analyze responses to questions with a critical eye, and do advanced research to find answers to your own questions from a variety of sources.
A person who has sufficient background in the arts, social and natural sciences to be able to read and learn, understand and analyze new material.
to stay current with information
Have at least a general understanding of commonly referenced historical events and themes, a commitment to understanding current events, and a critical thinking capability to adequately assess the quality of information.
Critical reading, writing and discussion. Openness to new perspectives and ideas. Ability to mold an opinion rooted in analysis.
to have been through a formal program of schooling, and also to be a person that seeks out continuous education through reading, working, etc.
Generally, someone who is educated has a Bachelor's degree. The person knows the basics of art, history, literature, math, science, etc.
To have a broad general understanding of the world we live in, to recognize cultural, historical, political, social, and scientific components of the world and its cultures. To be able to read and understand news sources, books, and periodicals. To have a curiosity about one's local and global surroundings. To be able to create connections between what one sees and how that information relates to the larger world. To be able to seek, digest and express information. To think critically. To have a sense of self-restraint that leads to good health, both physical and fiscal. To manage one's life in an organized manner.
Able to make knowledge or evidence-driven decisions. Well-rounded. Understands culture in which s/he must operate.
Someone with broad-based knowledge who has studied, read, and thought about, a wide range of subjects. Someone may be a great accountant, but if they know nothing outside of accounting they are not an educated person.
An educated person has a degree of some sort, or at least is working toward a degree. An educated person has knowledge of a specialized field.
that / one is comfortable that one can always learn (often something new) / change is constant and needs to taken into consideration for your plans for keeping up to date / content with value and meaning is worth learning and also will get used
One who can apply knowledge to changing life situations over time.
An educated person knows how to learn and knows how to apply learning.
literate -- reading, information, technology, civic,
someone who has learned the skills to survive everyday life
To be well read across the disciplines. Having a bachelor's or advanced degree helps.
A person engaged in the larger world, and capable of learning about what matters to them and to their communities (broadly defined). / / The shorthand that someone with a degree is sufficiently "educated" may well apply, but is too narrow. I would consider "educated" probably most people who are capable of supporting themselves financially.

a person who has the ability to deal with information analytically and critically. An educated person questions things and uses relevant information to come up with and intelligent answer

Table 4-25. The Open-Ended Survey Answers from Teaching Assistants

What does it mean to be an educated person?
understand diversity and accept various perspective on societal problems / concern about ethical issues
Either having at least AA degree (formal education) or life experience
Someone who is capable of developing an informed argument and capable of critical thinking
Having a higher education degree
Being an educated person means possessing sufficient skills in communication and critical thinking, and a sufficient body of factual knowledge in one or more areas of study, to make a positive contribution to the knowledge state of society through research and/or dialogue.
An educated person by today's standards involves some level of postsecondary degree.
To have received a certain level of schooling. In this era, at least a bachelors' degree at a univeristy. Obviously there are varying degrees of skill and knowledge one obtains going through this process but I believe an undergraduate education has now become the baseline.
A broad awareness; the ability of think critically and evaluate new information; the ability to fit new knowledge into the framework of what is already known.
To have acquired, by instruction and/or experience, the necessary skills to function in a specific capacity and environment.
To know that you don't know enough.
Someone who is able to take in information from a variety of sources (visual as well as print or audio) and evaluate/analyze that information, connect it to previous knowledge, and do something creative with it if possible.
To be well-read and having the ability to construct reasoned arguments, even if you do not support the viewpoint you are arguing for.
A person who is well-informed of the state of the world, has developed analytical and critical thinking skills, and is capable of formulating their own opinions on matters.
An educated person has basic knowledge of a number of important subjects, is literate and has basic mathematical skills. Moreover, an educated person is reasonable and can understand the structure of arguments. He/she can think on his or her own and critically and creatively evaluate them. An educated person knows how to obtain more knowledge and acquire new skills when he/she needs to.
A person who is experienced and an expert in his or her career field.
To have well informed knowledge on a broad swath of topics and be able to think critically
I believe an educated person is someone who has learned an amount of material above the average for that particular group of people. However, I believe it's not a terrible useful moniker. I'm more interested in whether a person has the ability and desire to learn. It's far

rarer to find someone who finds continual enjoyment in new information, especially outside of their ostensible field, than it is to find someone who is well read.
knows good to bad
This is a very philosophical question requiring more time and thought than I am able to dedicate to answering.
An educated person is able to critically evaluate information presented to them to successfully navigate new experiences using knowledge and tools attained by previous experiences.
One who has knowledge and expertise.
Not sure. Maybe college grad
Clear and concise thought process; able to research well; has a degree
To have a foundation of knowledge that enables you to learn new information effectively and integrate into what is already known.
Someone who focuses on learning throughout their lifetime.
An inquisitive mind
Someone with at least a basic understanding of normal topics/subjects and the ability to apply this knowledge to their everyday existence.
For me, an educated person can understand and apply the underlying knowledge into real life,
Being wise enough to realize what one doesn't yet know, and seeking out that information as well as refraining from judging others based on one's own ignorance.
To possess an expertise in a subject that demonstrate not only a high level of knowledge but an understanding of depth and breadth for a given subject. Moreover, being an educated person is about the responsibility to distill knowledge that protects as well as advances our understanding of phenomena.
One who is familiar with a topic or range of topics.
I have been in and out of college for the last 20 years, and I still don't know what it means to be educated. The more you learn, the less you realize you know.
To have received an education
Being an educated person means understanding yourself, the surrounding world, and how you fit into the world. These understandings don't have to come from formal institutions.
Having enough of a knowledge base about a number of topics to be fully functional in your own context. Being able to use what you do know to look up or reason out things you might not know. Having enough pre-existing knowledge to evaluate the quality of new knowledge and information you encounter in daily life.
To be able to think about material and not just memorize.
An educated person is someone who possesses an interest and thirst for knowledge and pursues these inclinations to practice their intelligence and fact-retention. An educated person does not merely attend school, but participates in the instruction and contributes to their own learning. Passivity contributes in no way to education.
I think that an educated person is one who can think clearly and independently. someone who is eager to learn new things and trends and is always updated.
to understand society and be able to see the world from various viewpoints

Top Ten Keywords of Educated Person

For the next step, in order to identify key terms useful in defining an educated person, 148 responses from open-ended questions from the online survey were compiled with 16 in-depth transcriptions of interviews using qualitative data analysis software tool NVivo. Based on this analysis, the top ten keywords for an *educated person* were selected using frequency counts and including similar words. These top ten keywords were analyzed by thematic analysis from combined data of all of the three groups, and all of the four academic areas.

The first keyword representative of an educated person in a multimedia digital age is *knowledge,* and then *content* and *abstract.* The forth keyword is *change.* Interestingly, the word *change* is highly ranked. And then, *communication, information, think, whole,* and *make* follow. The tenth word associated with an educated person is *give.* In the Table 4-26, the frequency of words used by all respondents are reported. The word frequency counts are including similar words and the counts are given in brackets after each word.

Table 4-26. Top Ten Keywords of an 'Educated Person'

Rank	Top Ten Keywords of 'Educated Perspn'
1	Knowledge (701)
2	Content (549)
3	Abstract (503)
4	Change (479)
5	Communicate (444)
6	Information (421)
7	Think (388)
8	Whole (363)
9	Make (325)
10	Give (293)

Seven Common Keywords of Educated Person

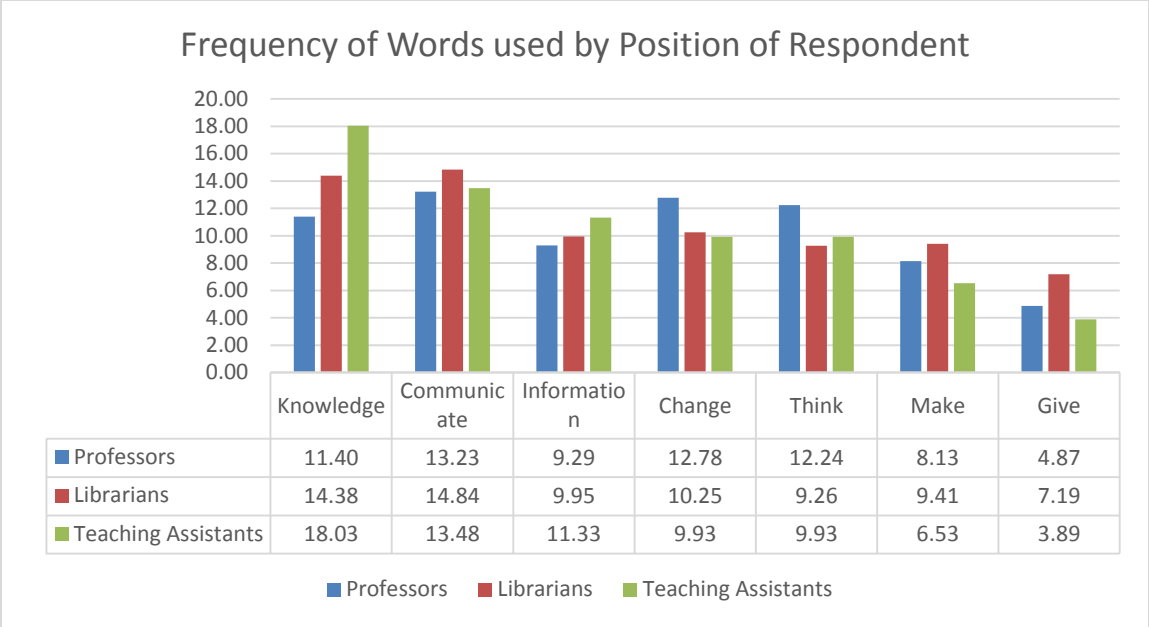
Each group's top ten keywords are slightly different. But, there are frequently counted common keywords regardless of role of respondent and academic area. Here are seven keywords of an educated person in today's society: 1) knowledge, 2) communication, 3) information, 4) change, 5) think, 6) make, and 7) give.

Frequency of Words used by Position

In the Table 4-27, the frequency of words used by position of respondent are presented. The word frequency counts are given in brackets after each word. Figures 4-11 depicts a graphic display including the frequency of words used by position of respondent.

Table 4-27. Frequency of Words used by Position

Position	Professors	Librarians	TAs
Top 10 Words (Frequency Count, including Similar Words)	Communicate (470) Change (454) Content (430) Knowledge (405) United (359) Think (335) Information (330) Make (289) Know (282) Work (250)	Communicate (194) Knowledge (188) Change (134) Information (130) Make (123) Think (121) Person (109) Whole (109) Organized (105) Gives (94)	Knowledge (218) Abstract (188) Communication (163) Information (137) Change (120) Think (120) Active (118) Person (95) Construct (86) Process (84)



	Knowledge	Communicate	Information	Change	Think	Make	Give
Professors	11.40	13.23	9.29	12.78	12.24	8.13	4.87
Librarians	14.38	14.84	9.95	10.25	9.26	9.41	7.19
Teaching Assistants	18.03	13.48	11.33	9.93	9.93	6.53	3.89

Figure 4-11. Frequency of Words used by Position

Frequency of Words used by Academic Area

In the Table 4-28, the frequency of words used by academic area are reported. The word frequency counts are given in brackets after each word. Figures 4-12 shows a graphic display including the frequency of words used by academic area are presented.

Table 4-28. Frequency of Words used by Academic Area

General Academic Area	Humanities	Social Sciences	Sciences	Professional Schools
Top 10 Words (Frequency Count, including Similar Words)	Abstract (187) Communication (172) Knowledge (154) Information (130) Change (126) Know (120) Person (101) Organized (98) Think (92) Making (90)	Knowledge (147) Communicate (120) Changing (94) Information (87) Content (82) Make (73) Think (73) Construct (72) Person (70) Educated (64)	Knowledge (249) Content (178) Communicate (169) Change (149) Information (149) Think (117) Educated (108) Person (104) Evaluate (95) Literate (85)	Change (110) Communicate (108) Knowledge (102) Think (90) Make (76) Give (66) Information (65) Active (64) Whole (62) Person (61)

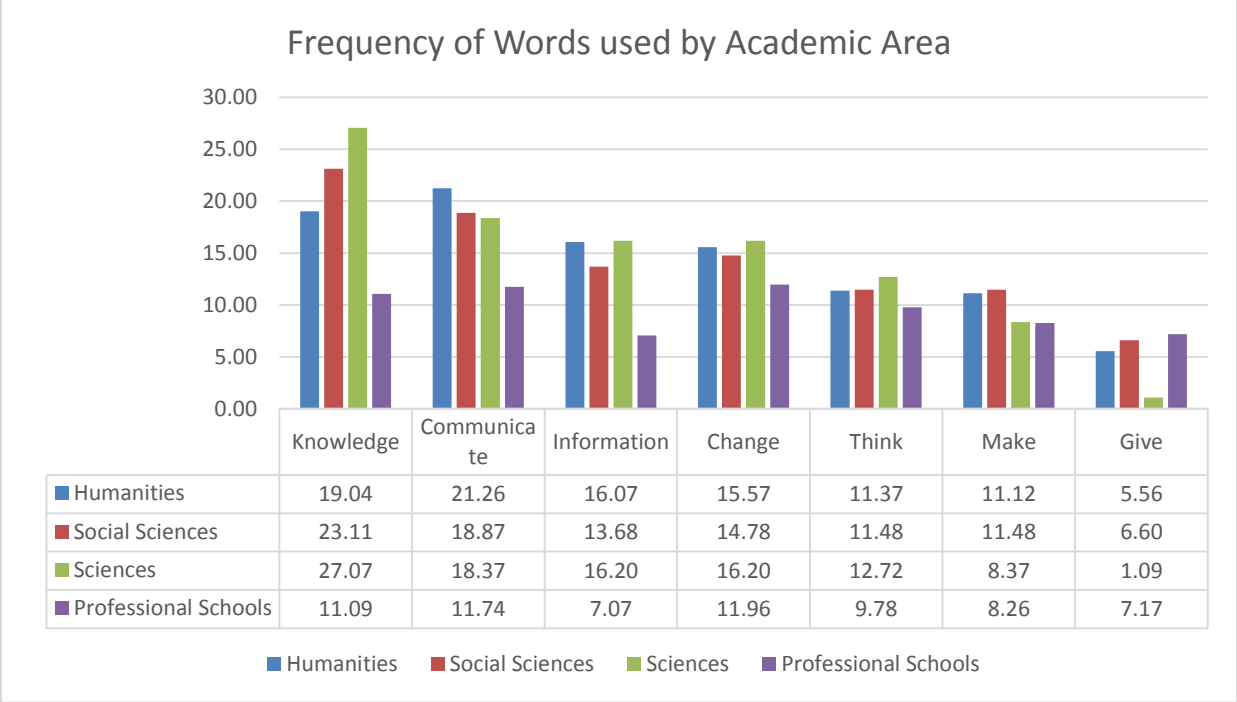


Figure 4-12. Frequency of Words used by Academic Area

CHAPTER 5: DISCUSSION WITH INTERVIEW DATA

Overview of the Study

This study emanates from concerns about a liberal education and this investigation explores a core topic within that overall discussion. It employs a mixture of exploratory quantitative and qualitative data analyses to suggest hypotheses for later investigations. This research looks at the changes of research papers in academia and makes a link to what it means to be an educated person in a multimedia digital environment.

According to the dean of the Harvard Medical School, Jeffrey Flier (2016), "In 2015 more than one million papers in bioscience were published – more than ever before, and reflecting enormous progress in biomedical research. But a growing number of high-profile retractions have led to a widespread belief that the results scientists publish are increasingly irreproducible." He continued to state that "Scientific journals are the major vehicle for disseminating science, yet there is little active effort to determine how best to deliver research results. In short, we need a science of how to publish science" (Flier, 2016). Filer argued about how to increase the productivity of scientific research.

In a similar manner, it was found that not only is the science area saturated but also other disciplines are as well since print publication outlets are shrinking. Scholarly book publishing in the humanities is a clear example of this as the movement to *born-digital* publication prevails and as students experience applications such as YouTube which had over 750 million views per day in February 2016 (Social Blade LLC, 2016).

Danielle Bradley, a teaching assistant of history department who, like all those interviewed, made her comments public and quotable by name. She shared her concern about how to deliver research results effectively in academia during the interview:

> I've been a graduate student for a long time now, from 2007 until now. And I think that I've seen there's this change with the digital humanities where professionals are trying to make research papers something that has a different format and that can reach a broader public. […] So, clearly there's awareness that we're not communicating effectively when we produce our research papers, but if we get rid of them, then I think the humanities might just fall part. We've got to find a way to re-invent but also re-invest in the research paper.
>
> (Danielle Bradley, history TA)

In the same vein, this investigation deals with the issue on changes of the format for disseminating knowledge or research results that may combine with the evolution of the meaning of an educated person. But, we might have to say it is not just changes of the format. It may be the expansion of the format to reach out to a broader research base and to the public at large.

Although multimedia digital publications (MDP) and research papers using MDP formats may not be fully accepted in academia yet, some educators are already making use of them through their broader roles as individuals who *profess* knowledge to others. Bonnie Firestein, a professor of biology and neuroscience department, shared her experience in publishing a peer-reviewed scientific video journal *JoVE,* and commented on the benefit of this from a researcher's view point:

> My experience was very good. […] Our article, JoVE is really based on teaching people the techniques that you know how to do in your lab, which I think is really essential. We wrote a new program for looking at the input centers for nerve cells. And often trying to explain to somebody through email or writing how to use this computer program is very difficult, but if you show them through this media,

> actually it's much easier and people understand it better. And our experience with JoVE itself was very good. They (JoVE videographers) came in, they videotaped, they were very quick.
>
> For me (as a researcher), (video journal) it is fantastic because we have people emailing us from all over the world; they want to use our computer program. And they'll use it, and the way the computer program gives you data, you have to have a certain file structure. So for me it's great because I just say: please watch this video. I send them a link to download it. And I always get back: oh, thank you so much, and it helps them. And also it's – I forgot how long that video is, but they can sit and watch it at any time. For me, if I had to answer each individual person for that amount of time I would never get my work done.
>
> So from my point of view, it's excellent because they get to watch it. They get to watch us doing it. And it answers a lot of their questions, and then if they have other questions I can answer them.
>
> (Bonnie Firestein, biology and neuroscience professor)

She also conversed about the advantages of video journals from the viewers view point:

> From the viewers view point, it's actually great, because they watch things being done in real time. So again they're not just reading an email from me, they're actually watching a person. We had a high school student as part of that video using the computer program. And if the high school student can use it, then the researcher knows that they can use it as well. So I think demonstration is often a better way for learning.
>
> A video is often a better way than just having something written, because also there are intricacies of the way […] maybe there's a certain way they tilt the plate that you don't get from something be written. It's just these little tiny changes that you don't realize that you'll see on the video. And I think from the viewer's point of view it's really powerful, because they'll pick these things up by watching rather than just having something written down.
>
> (Bonnie Firestein, biology and neuroscience professor)

Noshir Langrana, a professor of biology and neuroscience department and a researcher who published in JoVE also shared the value of video journals:

> Video journal articles show the power of the work, and show how effective one can do things – that you can not necessarily write everything in detail. You have

> to observe that. So when it comes to observing things, video journal articles are very valuable. So that's why we went in that direction. So showing the power of DNA hydrogel, how taking the different combination, what happens, how the gel swells and how the gel contracts, and how one can change the substantial difference of the whole nine yards.
>
> Otherwise, it's just saying, "Believe me. It is true," when you write a journal article. You don't see that. Video, you literally see, "Yes, this is what is happening." So it is a very strong message one can communicate, so it has a place.
>
> Like, I was talking to you about that article that popped from University of California, that's saying that a paralyzed person can walk for the first time. There's no way you can show that in any other way but the video, and not only video, but you can also show the nitty gritty of the set up and how he was prepped and how they made certain that he doesn't fall and hurt himself.
>
> And again, there are limitations because when you see the headline, you have certain different concept, "Oh, wow. He's walking, he's walking like us." No, that's not true. But he can walk. He is walking in the harness, but that's fine, he can walk. You can watch the whole thing. […] I think the video is very important. Something that is moving, something you are animating, I think that's very good to do.
>
> (Noshir Langrana, biology and neuroscience professor)

Moreover, the advantages of knowledge sharing through multimedia format will not be restricted to the science area. It can also apply to other areas, such as humanities, social sciences, and professional schools. Frederick Scott Bentley, a teaching assistant of industrial relations and human resources department compared text-based and multimedia-based publications.

> Sometimes reading through things – it's difficult. I think it's also though – to use an example – it's almost like text messaging and a phone call, or talking to someone in person. You can read a text message and interpret it in a variety of ways. And you can very easily misinterpret it. But if the person just said it directly to you, it limits that ability to misinterpret it. I think the same thing can be said with print versus multimedia. Sometimes in print, if you see an asterisk or a footnote, it almost seems as though sometimes something is hidden. Like, they're hiding – like, it should have been in here, but we're gonna put it somewhere else. And it always kind of makes you question, you can't ask anything about that.

> Whereas with multimedia, I feel like there would be a little bit more explanation. Maybe if you see someone's face and how they are describing something, you might be more compassionate or understanding towards certain things. Or just hearing their voice describing it, even if I can't watch it. I feel like the difference between hearing their voice and seeing them say it, might be better than reading it, versus the other two. Because it's very easy to misinterpret what people are saying when you're just reading the text. About tone, or like aggression, things like that, but if I hear them saying it, it's a lot easier.
>
> And also when you read something, you don't get to visualize a person necessarily, but when you hear their voice, you start like a visualization, and I feel like that could either work for them or against them, but either way as the recipient of the information, you kind of have a closer connection to that individual, and it makes it easier.
>
> (Frederick Scott Bentley, industrial relations and human resources TA)

Although Frederick Bentley has no experience in publishing in a multimedia digital journal yet, he said he is willing to publish an article using MDP format in the near future. He suggested that qualitative researches using interview data will also get benefits from MDP format.

> I think that it's worth – I think it's something that can be done across disciplines. I think it's more important in others probably, like for example medicine, or biology, like the hard sciences it might be easier. The other way it could be used, if really allowed, would be through qualitative analysis. So instead of having to transcribe everything, if you could show snippets of video at different points, or if you get to an interview and instead of reading the text, you click a footnote and the video comes up to show that actual interview, that might be more interesting than just reading a transcript of the interview itself.
>
> And so you can see that qualitative aspect, instead of just reading it, you could see the interview. Because sometimes, we have courses in qualitative analysis about doing interviews and writing up the results of that, and the one thing that's always left to the author, and I've always been kind of puzzled by this, and viewed it as a limitation is, they interpret emotion and convey to the reader. But you and I could watch someone say something and have two different reactions. I could say they're being condescending, and you could say they're being compassionate. We could both be right, but it should be up to the person receiving the information and how they view it, and not up to necessarily the author, who is trying to tell a

> story and fit that interview to that story […] And I think having the video actually would be a really good way to mitigate some of those possible biases.
>
> (Frederick Scott Bentley, industrial relations and human resources TA)

Like Frederick Bentley, 13 of 14 interviewees responded positively and said 'yes' about publishing in journals using MDP format in the near future regardless of their current position (professors, librarians, or teaching assistants), gender, age, and their experience in MDP. However from a different perspective, David Redlawsk, a professor of political science was not positive to publish an article using multimedia digital formats:

> I'm not unwilling. I just don't know how it would work. I don't know in my field what would be added. I mean, political scientists of the kind I am in any case – quantitative political scientists were driven by analyzing data, collecting survey data or experimental data and running traditional statistical analysis on them and then publishing the results and so I don't even know what would be multimedia in that context for what I do. I'm not opposed to doing it. I just don't know what it would be.
>
> (David Redlawsk, political science professor)

Professor Redlawsk's comments are related to the issue of legitimacy of multimedia digital publications in scholarly communication. Later in the interview he remembered he had produced a video which was posted to journal's website:

> Now I just came off five years as an editor for the journal *Political Psychology* and we talked a lot about a lot of issues relating to the journal and trying to enhance its visibility and all that, multimedia was not one of the things – well I shouldn't say that, that's not exactly true as I talk about it.
>
> We did do – and now it reminded me because I participated, we did start doing some videos where an author would talk about his or her paper and they would be posted on the journal's website. Why I forgot about it because I talked and I did a special issue on the Obama presidency and we did a video where I talked about

> that and so we've done a little bit of video work for the journal *Political Psychology* and posted it on the website of the journal.
>
> (David Redlawsk, political science professor)

Meanwhile, several educators talked about the issue of tenure and promotion in academia linked with publishing in journals using MDP format as its legitimacy:

> Especially for situations like tenure, so if you are the faculty who worked many years updating this wonderful site that had won awards or had actually been cited many times in various publications, etc. and how can you really say that that is equivalent or more a refereed publication? […] There was a search at the School for Arts and Sciences for digital humanities senior faculty hire and I think we had three candidates on campus who had different kinds of digital projects that they had spent a lot of time creating and required a lot of research skills, time and energy to do that. One of the big questions was how would that be valued in terms of tenure and promotion? Even to create these packets for promotion, I think of tenure with this personnel packet at Rutgers. It's still pretty much print based. […] He or she can print abstracts very well but to really convey and print format what the project was is difficult and even if there was a narrative here and there, how to print that without losing the visual aspect of it. I think that is one issue that digital multimedia projects do face.
>
> (Kayo Denda, social science librarian)

> They (multimedia digital publications) don't count for tenure; they're not taken seriously even though for years now professional scholars have wanted other types of work like giving research papers, publishing research papers online. They want it to count towards tenure, they want this legitimacy for the research paper that it's not getting and I'm not sure why because there's a sense that tenure review boards are the enemy. These professionals are also part of tenure review boards, so I don't understand why there's this disconnect between the professionals who want the digital research paper to be legitimate and then the tenure boards because it's the same people who are in both fields, so I don't know why it doesn't have that legitimacy.
>
> […] And if you work in the digital humanities, like blogs, data production, like digitizing medieval manuscripts or trying to do statistical analysis about the words used, about poetic meter, if all of that digital work isn't taken seriously as research then we're producing all this work that isn't going anywhere and that's leading a lot of people to question whether we

> should even be doing research papers. There's been a lot of writing on blogs and I think I even read something in *The Chronicle of Higher Education* about how we should just get rid of conferences because they're not helpful.
>
> (Danielle Bradley, history TA)

> Multimedia-type publications, as long as it's peer-reviewed, it should counts as equal (for the faculty tenure or promotion).
>
> (Noshir Langrana, biology and neuroscience professor)

> I think that multimedia journal articles if they're experimentally based and not methods based count as much as a print paper. […] But I should say that our JoVE article goes hand in hand with another paper that we published, which was in Cytometry. And so that paper described the method, but then the JoVE article actually showed them how to use the program, and if you think of it as a whole and an item, I think it actually strengthens it. So maybe by itself it wouldn't count (for the tenure), but as a whole it actually gives me more recognition in the community, and that translates to tenure, or I don't have to worry about tenure, but that translates to whatever the next promotion is.
>
> (Bonnie Firestein, biology and neuroscience professor)

The issue of multimedia digital publications counting as much as a print publication for a faculty member seeking tenure or promotion appears to be a controversial topic in academia.

Similarly, the issue of students doing a digital research papers is also going through a period of transition. Some of educators said the practice of replacing a written research paper with a multimedia digital research paper or presentations is more prevalent than before:

> I think it's becoming more and more prevalent. I don't think that many of my colleagues read the written paper anymore. I think most of us go online and we use – so the written paper for us often is the same as the digital paper, only the

difference is the digital paper has links to other things. I think the majority of my colleagues that I've spoken to and deal with, and as we write grants, really deal more with the digital and multimedia approach. And I think that the paper, even though I still like to read things on paper, I think that it's becoming less and less common.

I think especially the point now that NIH, National Institutes of Health, when things are funded by them; they want open access for everybody. And so I think that digital is much easier. You can't guarantee that there's open access if you have a paper copy, but with digital or multimedia everybody has access. And I think that very soon that any typical paper article or media is going to be debunked, at least for scientific research. I wouldn't say for novels. I still like to read novels. I don't read them online, so there's still old timers like me.

(Bonnie Firestein, biology and neuroscience professor)

I think there's pressure in doing this. I think first the pressure comes on the practical side that professionals want to see more multimedia as you see in companies. You see publications that are targeted for professionals. They use greater amounts of multimedia. Like every single business school, like most major companies, now have YouTube feeds—they're assuming that people are not reading their brochures, not reading their annual reports. Now the way people consume this is through a podcast, is through a video. It's as through something other than the traditional communication mechanisms, right?

And so I think the pressure is coming from the professional side. And I think increasingly it will come from students because this is how they probably have learned before. As more multimedia is used for children who are in elementary school and in high school I think we in the university will see a greater and greater need to shift to that direction, which I think generationally or practice-wise is something that really is different.

(Alexander Settles, business school professor)

I think it's becoming more and more (prevalent) for undergraduates. Undergraduates, I think it's becoming really common partly because it's easier. […] They (undergraduates) think that it's inherently easier to create a multimedia presentation than a research paper because research writing scares them. They think it's going to be easier, then they get low grades because they don't realize they have to put in thought, that it's still research.

(Danielle Bradley, history TA)

> I would say it's pretty prevalent, it allows for students to see other styles of both, not only how to display information on a PowerPoint, but also how to communicate it to the audience. And you might start picking up on beneficial aspects of other people's presentation styles that you would kind of start to adopt going forward.
>
> […] If the person is not a good writer, they don't know how to communicate in written form. And sometimes you don't have the ability to communicate in a multimedia way or present, all you have to do is write. And if you don't have that skill set, sometimes you might not see the outcomes you hoped to have. And so being able to do both, I think, is very important, but there are several benefits associated with introducing more multimedia in the classroom. I think that's something that we're definitely doing, and has been done.
>
> (Frederick Scott Bentley, industrial relations and human resources TA)

Meanwhile, other educators told that the practice of replacing a written research paper with a multimedia digital research paper or presentations will not be prevalent in some areas:

> In the English department, I always think there are probably two or three of us who move in this direction, maybe four of us, out of 60. Most people, I mean people use Sakai and use a lot of digital tools, but really for the same purpose, not using them to analyze by and large, but to present. We are mostly paper-based, still, which makes a lot of sense. I mean it's the English department in which that makes a lot of sense. If you went to economics and asked those questions, those guys better be doing all kinds of digital stuff. Yeah, right. And librarians, the people who have to be digitally literate. English majors, not so much.
>
> (Martin Gliserman, English professor)

> Depends on the subject area. […] Some people will say yes and some people will say no. When you think of how scholars communicate with each other, they go to conferences, you do it both ways. You do a PowerPoint presentation, which you speak to the audience, and then if you have peer-reviewed published proceedings, you write the paper. […] Both are expected of scholars. Some people do better at the presentations than others; some people do better at the written paper than others. I don't know. It depends.
>
> (Roberta Tipton, business librarian)

> I don't think it's that prevalent right now, I think particularly in accounting and financing there's really a strict clinging to the original practices I think in some ways. […] I don't see – it's going to be a long time before academics catch up with – become really totally digital. That's my opinion. (But) I think the real business world is very interactive. […] I think you'll find that more in the real business world, they may have – like the data may be some place online or in a Cloud type base system, but you find more businesses, they tend to – don't have a lot of time for the background information. There may be some attempt to justify sort of positions of their research but I think they tend to get more towards showing like interactive or more active visualization of their work and what they're doing. Whether it's a dashboard – for example, for one project we created a dashboard, actually it was an active online web capture of different steps, you went through this dashboard. It's very educational and people learn from that. It really depends on the environment and the situation.
>
> (Deniz Appelbaum, business school TA)

It is also assumed that the definition and format of the research paper is undergoing dynamic changes and challenges in the emerging world of multimedia production. This study attempts to explore how the research paper is changing in ways that may redefine the meaning of an educated person in a digital, multimedia society. Below are discussions from each research question that might be applied to each problem area.

Discussion from Research Question 1

Individuals enter a discipline at a particular point in time and it is likely that their use of multimedia digital publications (MDP) will differ across generations, academic areas, technology abilities, digital presentation tools (DPT) use, and the instruction methods used in classes. Initially, there were 23 variables in this exploratory, hypothesis seeking investigation. It is expected that younger educators, more likely from the science

area, with higher technology abilities, and with more use of DPT and digital instruction methods will have more use of MDP.

However, statistically significant analyses of the impact of demographic variables such as age and academic areas were not significant. There are significant correlations between use of MDP and four of the major factors in the research model: 1) self-perception of technology abilities, 2) use of minor DPT, 3) traditional instruction methods, and 4) digital instruction methods have positive (significant) correlations with use of MDP (r = .26, r = .18, r = .17, and r = .18 respectively). This observation suggests that educators who have higher technology abilities, and with more use of minor DPT, and often do traditional and digital instructions will have more use of MDP.

Then, the data analytic plan led to hierarchical multiple regression which was performed to understand how well use of MDP can be predicted by the complete set of independent variables and how much variance is uniquely explained by each independent variable when the contributions of other predictor variables are statistically controlled. The overall regression, including the one with a control variable and four predictor variables, was statistically significant, R = .85, R^2 = .72, adjusted R^2 = .71, F (5,125) = 63.91. The overall model (Model 5) indicates 72% of the variation in educators' use of MDP can be explained by the control and the four predictor variables. It seems that educators' actual use of MDP are affected by their confidence of their technology skills or their early adopter status such as more use of minor DPT (Keynote, Prezi, Haiku Deck, and SlideShare) and use of both traditional and digital instruction methods (face-to-face, in class, email, online chat, and social media).

In addition, significant and strong positive correlations exist between the educators' familiarity with MDP and their actual use of MDP (r = .84). This finding is important, because "the measures of product use and a person's objective knowledge structure about the product may not necessarily be related. Product knowledge was also shown not to be correlated with involvement to the product" (Zaichkowsky, 1985, p. 299). Sometimes what we think we are familiar with in a certain publication or product may not be directly linked to our actual use of the product. Also, what we actually know about a publication or product may not necessarily be derived from its actual use. Interestingly, in this investigation, educators' familiarity with MDP is considerably linked to their actual use of MDP unlike the previous study (Zaichkowsky, 1985). Therefore, this exploratory study suggests that the familiarity with multimedia digital publications affects its actual use. Further, even basic knowledge of MDP seems to allow the individual to be more open to advanced uses of MDP. Meanwhile, for future studies, perhaps one might employ specific indices of MDP familiarity and its potential uses to assess the individual's likely use of such information in research and teaching. This has implications for journal marketing campaigns that may hope to move from static environments to more dynamic multimedia platforms which include such formats as video or three-dimensional interactive displays.

Discussion from Research Question 2

The underlying idea of the second research question is how different venues might communicate scholarship and knowledge; in other words, the impact of form of publication as a credible representation of authoritative knowledge. Before addressing

these issues it was important to first assess what features of the professors enable them to publish in journals using multimedia digital format (MDP). Then, the next exploration was to see whether professors' experience in publishing journal articles using MDP format is linked to their classroom activity in giving MDP format assignments to students as equivalent print research papers.

In the first Binary Logistic Regression (BLR), four independent variables (age, number of teaching years, academic area, and use of MDP) were regressed over the dependent variable publishing in journals using MDP. Among the four independent variables entered in the logistic regression, the two variables with significant coefficients were an age (Exp(B) =.237) and academic areas, in particular science area (Exp(B) = 21.486). This means younger professors in science areas can be better predicted to publish more in MDP than those in other academic areas.

The second BLR was cast to assess the prediction or classification accuracy of using individuals' experience in publishing in journals using MDP to predict their giving assignments to students using MDP formats. There was no significant coefficient between the predictor and the dependent variable. It seems that professors' MDP experience does not actively explain the formats to be used in classroom assignment by students.

Nevertheless, a biology and neuroscience professor Bonnie Firestein, who published in a video journal, noted that she uses both print-based assignments and in-class presentations about 50:50 in her classes. She thinks, overall, there will be fewer written papers in the next five years:

> I teach half of the class, and they (students) do one presentation in that half. And so that, and then they write papers every week. And I would say probably the presentation is about 50 percent and the papers are 50 percent. So even though the presentation is only one week out of maybe the eight or ten weeks, I actually put a lot of stock in that, or a high percentage of the grade because I think that you can get a better evaluation of how the students are thinking and how well prepared they are, versus just a piece of paper, so it's about 50/50.
>
> I actually think we're going to have less and less written papers. So I think that some of the formats, which I'd like to see, which I think would be better is some online discussion. A lot of granting agencies are going to this, where maybe I'll say: okay, I want everybody to post a comment by a certain time two days before a class meets. And I want you to post a comment on which paper you think is better and why. And then what would suffice for Bonnie [sic] if people could then have a conversation.
>
> And kind of the climax of the conversation is the presentation, where we can discuss it even in more detail. And I think that would be probably a better platform than just papers, and I think that's a direction we will go to in the next five years.
>
> (Bonnie Firestein, biology and neuroscience professor)

Also, a business school professor, Alexander Settles, commented that multimedia presentations are prevalent in business schools and that this has been true for some time:

> In my discipline there is a long tradition of multimedia presentations. The balance between written research presentations and multimedia presentation has been shifting towards multimedia presentations due to the sophistication and ease of use of such tools but the overall balance has changed little in the past 20 years. Business people have always used these techniques - only the technology has changed.
>
> (Alexander Settles, business school professor)

Some professors give assignments to their students using multimedia digital formats regardless of whether they have MDP publication experience or not. It seems that multimedia digital papers and presentations maybe not prevalent yet, but they are notably increasing in academia.

Discussion from Research Question 3

This third research question examines professors' perception and evaluation in changes to research papers over time: what their experience was with research papers when they were undergraduate students; what changes have occurred when they were graduate students; what their current practices are with research papers or equivalent requirements; and, what changes might be expected in the next five years.

First, all of the professor interviewees shared information about their own undergraduate and graduate experiences with research papers. Most of them had no computers or information technology when they were undergraduates and graduate students. Instead, they used a typewriter for producing papers. Their research work was based on printed materials in libraries:

> As an undergraduate, I did a senior thesis on William Blake and William Butler Yeats. Yeats and Blake, doing their kind of visionary ideas about life. It was all library book based. So, it was nothing else. This is 1966-1967.
>
> In graduate school, the same thing, more intensely. Many more books, many more articles, library, library, library, desk, cigarettes, typewriters. The most painful part of all of it, it was the typewriter, because you can never correct anything. I wasn't a great typists. I have to tell you, it was absolutely the most frustrating thing, because the computer life is just totally different. You know like this—send it and throw it out is not enough to tear the paper out of the typewriter and start from the beginning, again? I don't really know how I survived all that aggravation. My blood pressure!
>
> So, all of my early work was, even my first book was totally library research-based, no computers until really the last round I had got my first Epson computer. It didn't connect well with the printer. And it was an aggravation on another level, but writing a dissertation on a computer was a big difference for sure.
>
> (Martin Gliserman, English professor)

> I was an undergraduate student a long time ago in the late 1970s. I wrote the usual undergraduate papers. I was a political science major and so wrote a lot of papers

related to campaigns, elections, voting, or things like that. Wrote them up pretty much on an old typewriter and rarely made any changes. Wrote it once and turned it in.

(David Redlawsk, Political Science)

I certainly remember reading research papers as an undergraduate and I participated in research as an undergrad and contributed to a research paper that was published. I think at that point I wasn't a very, you know, aside from doing experiments that led to my contribution and putting that data into a figure and writing the methods and writing a couple of paragraphs about it.

When I was a graduate student, I work with the PI the principal investigator of the lab who really put together the whole package. But it was a fun experience to be part of making that contribution. As far as reading research papers—certainly I needed to read them in preparing for my research and also for certain classes it was required, but obviously at that point everything is for going to the library, taking journals off the shelves, making a photocopy and that was true in graduate school as well.

(Nancy Walworth, pharmachology professor)

So as an undergraduate student, I actually did an honor's thesis, but we didn't really publish a paper, we published an abstract for a meeting. And I think if I can remember that far back, I remember Xerox and looking at papers in the library and having journals in like little rooms in the building, you know, like little libraries building like we have here, meeting rooms.

And as a graduate student, I also think it was the same thing, most of the papers that I read were Xerox copies out of journals. So I would go to the library and I would copy them. And then I had stacks of papers, like when I was writing my dissertation stacks of papers. And everything – nothing was really electronic except for typing up my dissertation for example.

(Bonnie Firestein, biology and neuroscience professor)

My undergraduate was in India, so it was mainly all practicing engineering, so in terms of research, there was nothing. Okay, so the research actually started when I came to this country for doing my Ph.D.

(Noshir Langrana, biology and neuroscience professor)

Meanwhile, Alexander Settles, a business school professor shared his research presentation experience when he was an undergraduate student. He had said presentation has a long tradition in business but it was not like PowerPoint these days, but they used an overhead slides. As earlier, he commented these presentation techniques always have been in business, but only the technology has changed:

> I made presentations as an undergrad. You would make slides. You'd make actual overhead slides that you would use during your presentation. And I remember printing – the big technological advancement that I had was not that you had Power Point but that you could print your overheads on your laser printer. And you could print them in color. This was the big advance.
>
> Because before that you would have to actually have someone professionally do it. Students were even able at that time in the late '80s, early '90s, to buy the overhead printing pages and then take them and just stick them in the regular printer. And you would get an overhead, which only ten years earlier you would have to have photographed and somehow – some professional would have to do it for you. But now you were able to do it, so that was an advance – so the way my students use Power Point today – we used overhead slides then.
>
> (Alexander Settle, business school professor)

What changes have occurred in the past five years continue to evolve at a rapid pace. Current practices with research papers or equivalent requirements for students have expanded across all of academic areas. Now all professors use computers and some of them use digital presentation tools (DPT) and multimedia digital publications for their research:

> I'm totally addicted to the computer. When I was in graduate school, I had questions that I couldn't answer. Because I would need a computer which I didn't even conceptualize at that point of time. But I was interested in the 18th century, 17 to 18th century drama. I wanted a chart of changes over time of the dynamics of character interactions which I could do now. I couldn't do that then. I mean it would just take forever. So now, so now all my research is really not library oriented. It's oriented with digital text and tools to analyze those texts. This is a

total revolution from everything I write to everything I think. At least in some of the classes that I teach.

(Martin Gliserman, English professor)

I teach political science and so I teach courses that tie to politics and particularly I teach some seminars, some first year seminars. And those students do a little bit of what I call traditional academic writing but they do more putting together a presentation about something, whatever the topic is. […] They certainly use computer based search techniques and I actually have a session with the librarian to talk about that and databases and all of that.

(David Redlawsk, political Science)

I think that's changed, it may be on a little bit broader timeframe even maybe ten years is for us in the biomedical sciences. […] So certainly a major change is that you know if I'm reading a paper or preparing a paper. But if I'm reading a paper and I need to look up a reference, I don't have to walk out of my office, right. So in the old days when I was a student or when I was an assistant professor here you know I would sit at my desk read a paper and figure out what articles I need and I would walk over to the library and I would get them and obviously now this is a click of the button – using the laptop. Yeah and it's right there in front of me so that's a significant change.

(Nancy Walworth, pharmachology professor)

I think the thing in research is that there is really this inertia or path dependency. You have to get published. You have to look like the previous publications. And so, the articles themselves, you're gonna see the type settings better. Maybe the graphs are better. The charts are clearer. But how the material is actually organized I don't think in business and economics has really changed in the last 50 years. In the academic journals.

In the professional journals, I think there was always this trend of having more graphical user information, but you're now starting to see a lot more of these online publications, like I had – I used this one chapter in a class that has the ability where you can manipulate the graphics. Like what it's trying to do is explain the relationship in foreign direct investment. And so what you're able to do is slide a toolbar along it, and you can see changes in distribution. You do it through HBR Interactive Materials. Now I haven't seen this yet used that much in presentation of papers. But obviously, this type of software could be used in presenting your materials if you're doing it online. […]

Because you might have previously had a spreadsheet that would have come along and you would have played with it. But this one actually has a graph inside the document, which I like. So in the past five years, the technology has been

changing – I've noticed this being changing, so what you're starting to see especially in the professional side that you're seeing more of this interactive material being presented.

(Alexander Settle, business school professor)

So the past five years, so I would say one of them is this journal called *Journal of Visualized Experiments (JoVE)*, where now instead of just having data, they actually have like movies of people, physically doing experiments and explaining them, that was very new to me. The other thing is that people tend to attach more supplementary data than they ever did, so a lot of biology looks at moving pieces in a puzzle. We're looking at moving molecules or moving proteins, and often just taking snapshots and pictures is not enough.

It doesn't really emphasize kind of the beauty of what's going on, the significance of what's going on. And so I believe that over the past five years more and more people have attached things like videos and movies to their papers.

So for research papers, we – as far as different supplementary data, for the most part nothing has really changed, although we're starting to do more types of experiments where you would actually need to put things like movies online.

But my experience really is more with using digital images and digital data platforms to submit to journals and publish, it's actually much easier. For example, as a post doc, we would take a picture of, let's say some neurons. And we would have slides made. And then we would take the slides, scan them back into the computer, so the pictures weren't even taken through the computer, they were actually taken by film. We'd scan it back in, and then we would have to get the colors just right in for example Adobe Photoshop before we could actually then print it out. And that would take all day because the colors might not match and then submit that to the journal, where now everything is electronic.

So it's not just the actual papers that come out, but the ease of which it is – the ease at which everything occurs now to submit your data, it's much easier. It's easier to actually submit larger piece in raw data if the reviewers ask for it than it used to be.

(Bonnie Firestein, biology and neuroscience professor)

I think it's getting more and more online, and more and more people are putting as a PDF file, and it's more and more open. So, even from NIH grants and NSF, all the publication has to be available to other researchers. So practice is now more writing papers – once they are approved, they're put as a PDF file for other researchers to look at it or view, and so forth. So it's more digital.

(Noshir Langrana, biology and neuroscience professor)

Then, all professors said the technology will be changing in the next five years. They expected they are starting to see more of interactive materials being presented in higher education:

> I would assume that things will escalate in the direction that they're going. There will be more video, audio, we have access to archives and archival material we've never had before. We have access to so much material in so many tools, we've had never before. I mean, as an English professor, the only tool we had was our brains, pencil, piece of paper, typewriter. Now we can really search text, things that are revolutionary!
>
> (Martin Gliserman, English professor)

> I'm sure the newer, younger generation is moving in that (multimedia and digital) direction as well. So I think that the journals are going to continue to do things that make that experience of reading a paper online more – to take advantage more of what's available online.
>
> (Nancy Walworth, pharmachology professor)

> In the next five years, I think that one of the things that's been changing is, it appears that more and more data are needed in order to publish. So what was considered top of the field ten years ago is no longer top of the field. You need more experiments to prove your point. So maybe ten years ago, you did two experiments, and you proved your point and they're really excellent experiments, and this is one point in a paper, and now you have to do four or five different techniques to prove it.
>
> I think with that type of mentality that is going to increase the amount of data that you need to submit for a paper, and more convincing data and real time data. People are asking for InVivo data, so animal data. I think a lot of what's going to happen is we're going to have to submit a lot of this data, or these data, and they'll have to be available online. I think it's not only the types of data, but the amount of data will be more in five years.
>
> (Bonnie Firestein, biology and neuroscience professor)

> We're all experts on PowerPoint so our students present things in PowerPoint. And they include PowerPoint slides as part of their reports, so I think that that's become a standard practice. And the expectation, even, I think of people who are

> hiring our students that they'll be able to put together a ten slide PowerPoint presentation on just about everything.
>
> Like e-Portfolio but like say you get asked a specific question at work. You write a five-page research report. You're gonna probably do two or three slides that go along with it because people are gonna look at your report but they want to know what you think is the most important thing. So that will – it's like an integral part of the research practice now is what sort of presentation slides are you gonna put together?
>
> And so I do that with research projects in my class is I have a component of where I give them guidance on how to produce their presentation part of it. So how to present the research.
>
> (Alexander Settle, business school professor)

All of the professor interviewees discussed that more and more multimedia digital publications and products will be used for their research. Moreover, professors will use those research tools for their students' in-class activities and for career preparation in their professional field. In the same context, the survey results also showed that the evaluation gap between print and digital research papers has diminished over time in all academic areas. Over time, there were some evaluation differences in traditional versus digital assignments based on academic areas. However, professors evaluated both *content and references* and *visual aids* in each of the two formats almost equally important. Even in the next five years, *visual aids* will be considered as more important on digital format research papers than on print format research papers. Furthermore, if it is a digital research paper, the status accorded to visual aids are essential regardless of their academic areas.

Discussion from Research Question 4

The fourth research question asks what it means to be an ‘educated person’. In other words, what are essential components of an individual who will be considered ‘educated’ in a changing multimedia era.

For this research question, the top ten keywords were identified which were linked to a definition of an educated person. This was extracted from the interviews and the open-ended questions on the surveys. The method used selected words based on frequency counts which included similar words. NVivo, a qualitative data analysis software tool, was used for this purpose. The top ten keywords were analyzed by thematic analysis from the combined survey and interview data with all three groups, including all four academic areas.

The first keyword representative of an educated person in a multimedia digital age is 1) knowledge, followed by 2) content, 3) abstract, 4) change, 5) communication, 6) information, 7) think, 8) whole, 9) make, and 10) give. Basically, ‘knowledge’ might be included in content, abstract, information, and think. Then, ‘communication’ can interact with keywords information and make. ‘Impact and contribution’ encompass change, whole, make, and give. Thus, on the basis of this research finding, 1) knowledge, 2) communication of knowledge, and 3) impact and contribution to society through communication of knowledge might be included in defining an educated person (Figure 5-1).

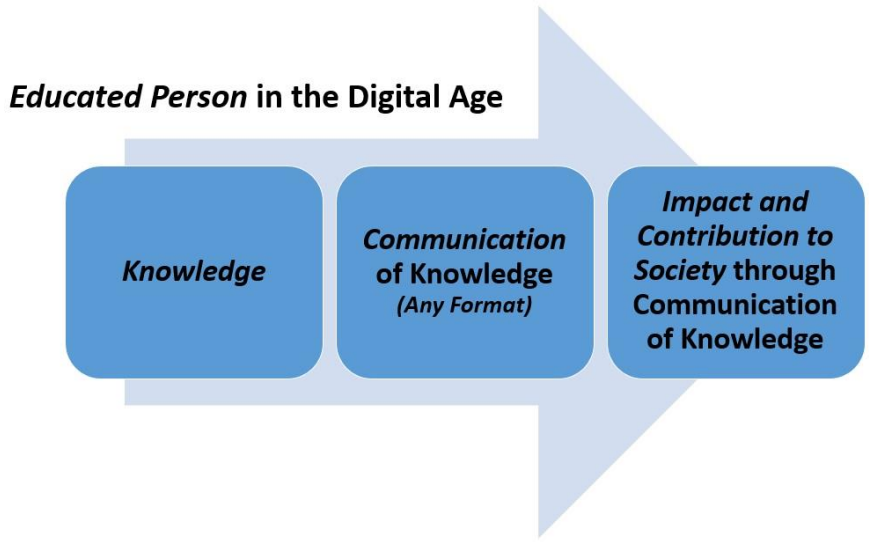


Figure 5-1. Educated Person in the Digital Age

Each group's top ten keywords are slightly different. Professors' top three keywords are communicate, change, and content. Librarians offer communicate, knowledge, and change. Teaching assistants pick out knowledge, abstract, and communication.

According to each academic area, educators in humanities focused on abstract, communication, and knowledge. Social science educators are concerned with knowledge, communicate, and changing. Educators in sciences enumerate knowledge, content, and communicate. Professional school educators focused on change, communicate, and knowledge.

Yet there are seven frequently counted common keywords regardless of role of respondents and academic areas. They are: 1) knowledge, 2) communication, 3) information, 4) change, 5) think, 6) make, and 7) give. In the narrative interview data, all of interviewees shared their opinion and thought about what it means to be an educated

person. Two professors were invited and agreed to be interviewed as resource individuals for undergraduate education. They shared their assessments about 'what it means to be an educated person in the digital age.' Both of these individuals are in charge of undergraduate education at Rutgers University. Here are some of their thoughts on this issue:

> The goals of an education have changed. They used to be learning certain things that an educated person should be thought to know, whether it was principles of Newtonian physics or having read Milton's *Paradise Lost* or John Bunyan's *Pilgrim's Progress*. Now, I've been on a number of curriculum committees here and it's been an interesting change over the years. The big one I was on '91 and there we had that debate a lot.
>
> And the only thing we could agree on was that our responsibility as a university was to teach students how to sort through the massive array of information available online, although we hardly had an online in those days, but, you know, technologies. But how we could get them with the explosion of information – and this was almost before we have what we have now – how we could get – teach our students not only to make sense of this, but also, and much more importantly, to sort out the bogus, the foolish – bogus first, foolish second – from what was real research and information. […]
>
> I do think an educated person is someone who's willing to weight the facts, but you can't weigh facts until you learn some critical thinking skills. Now, universities all over the country throw that word on their websites quite happily. Critical thinking – come here and you'll do critical thinking.
>
> We do it in our program. We even do it in my signature course here and it's all about critical thinking. But it's also vastly important. If we don't get a citizenry that thinks critically rather than politically all the time we don't have a democracy. That's the bottom line for me. So an educated person now ideally, from my point of view, should be someone who, yes, pursues with absolute dedication the fields which he or she want to work in, whether it's engineering, or business, or a humanistic subject, or what you're doing, or librarianship. […]
>
> So an educated person, for me, is a person who can think critically about the masses of information in front of her or him. An educated person is someone who cares enough about his or her place in a global context to learn a language and an educated person never allows herself or himself to say I'm an American. I don't care about the rest of the world. […]

So that's my answer. I've talked on too much, but an educated person knows that he or she knows enough to understand how much you don't know and knows that anything that we learn these days has to be learned in a context that is not just American and that means languages too.

(Barry Qualls, vice president of undergraduate education & English professor)

I think this is a very complicated issue. As you know, we are undergoing a technological revolution and the consequences of that revolution are not at all well understood. Could be wonderful, could be terrible, right. So, I mean, people always go back to the success stories of the past.

So for example, when the Greeks invented alphabetical literacy, Socrates said, this is going to be a disaster. Did not happen, right? When the printing press was invented, people predicted that there might be bad effects but it did not happen. It turned out well.

On the other hand, technologies of communication have implications. So for example, in most Arab countries, Arabic-speaking countries, a very small percentage of people can read and write because Arabic is so difficult. Classical Arabic is still the print language in most Arab-speaking countries. There is a huge disjunction between the spoken Arabic on the street and classical Arabic, which nobody speaks except perhaps the Saudis. […]

So here's another example. As you know, in Korea, Korea switched to alphabetical literacy. Chinese people still use ideograms. Now again, very difficult to learn that. Can be done but difficult. Makes mass literacy harder, right. And the Chinese themselves went to a simpler form because the classical Mandarin was so difficult to master, right. The only people with great amounts of leisure time.

So I'm just prefacing my remarks. My feeling is that to be literate, to be an educated person today, you have to say educated for what, right. So, not all education is the same for everybody. So for example, people who go to Princeton, Yale, Brown, Harvard are actually being prepared for careers in which print literacy is very important. The global leadership elite are highly literate. […]

So anyway, my feeling is that it is important for them (undergraduate students) to be able to learn how to use these technologies. The myth is that when they come to college they already know these technologies, and they don't. They're not very adept at using the internet. They're not very adept at finding information. They don't read anything of substance on the internet.

The internet has had positive effects too. So for example, long-form journalism has survived on the internet because you can do it so cheaply. So there are a number of places where you get really excellent long-form journalism online. And

it would be impossible financially to do that now. Even places like the L.A. Times, it has some wonderful features online with photographs, really beautifully done and other venues too. There are other sort of like – I do think that the internet has made it possible to have a resurgence of discourse on the left. […]

I mean, I feel that (an educated and) a digitally literate person would be somebody who is able to read the internet critically and see the connection between information – to evaluate content but also understand the forms in which content would be conveyed, right. So that's a very complicated kind of literacy.

(Kurt Spellmeyer, director of writing program & English professor)

Review of Research Questions, Hypotheses, Results, and Revised Model

The results for the research questions are summarized in Table 5-1. Hypotheses H1c, H1d, H2a, H2b, H3a, H3b, H4a, and H4b were supported. The remaining hypotheses were not supported. Figure 5-2 shows a revised research model based on these research findings.

Table 5-1. A Summary of the Research Questions and Hypotheses

Research Questions	Related Hypotheses	Results
RQ1. How are current knowledge and practices of educators (professors, librarians, and teaching assistants) affected by use of multimedia digital publications (MDP)?	**H1a.** Relatively younger educators will have more use of MDP compared to older educators.	**H1a.** hypothesis not supported
	H1b. Educators in the science areas will have more use of MDP than those in the areas of humanities, social science, or professional schools.	**H1b.** hypothesis not supported
	H1c. Educators who have higher self-perception of their technology abilities will have more use of MDP than those who have lower self-perception of technology abilities.	**H1c.** hypothesis supported
	H1d. Educators who are more familiar with MDP will have more use of MDP than those who are less familiar with MDP.	**H1d.** hypothesis supported
	H1e. Educators who use more digital presentation tools (DPT) will have more use of MDP than those who use fewer DPT.	**H1e.** hypothesis not supported

	H1f. Educators who use digital instruction methods will have more use of MDP than those who use traditional instruction methods.	**H1f.** hypothesis not supported
RQ2. Are there differences among professors who themselves publish using multimedia digital publication (MDP) formats compared to professors whose publications are in more traditional text formats?	**H2a.** Relatively younger professors will publish more in journals using MDP format than older professors.	**H2a.** hypothesis supported
	H2b. Professors in the science areas will publish more in journals using MDP format than those in the areas of humanities, social science, or professional schools.	**H2b.** hypothesis supported
	H2c. Professors who use MDP will publish more in journals using MDP format than those with low uses of MDP.	**H2c.** hypothesis not supported
	H2d. Professors who use MDP will publish more in journals using MDP format than those with low uses of MDP.	**H2d.** hypothesis not supported
	H2e. Professors who had one or more articles published in journals using MDP formats will be more likely to give assignments to students using MDP formats.	**H2e.** hypothesis not supported
RQ3. How do professors evaluate components in each of the	**H3a.** Professors' evaluation gap of 'content and references' in each of the two formats will decrease over time.	**H3a.** hypothesis supported

two formats (print and digital formats) over time?	**H3b.** Professors' evaluation gap of 'visual aids' in each of the two formats will decrease over time.	**H3b.** hypothesis supported
	H3c. Science area professors' evaluation gap of 'visual aids' in each of the two formats will be lower than professors in humanities, social sciences, or professional schools.	**H3c.** hypothesis not supported
RQ4. How do educators (professors, librarians, and teaching assistants) define an 'educated person' in the digital age?	**H4a.** There will be common keywords to define an educated person.	**H4a.** hypothesis supported
	H4b. There will be some differences in the frequencies of keywords used to define an educated person according to the individual's position and academic area.	**H4b.** hypothesis supported

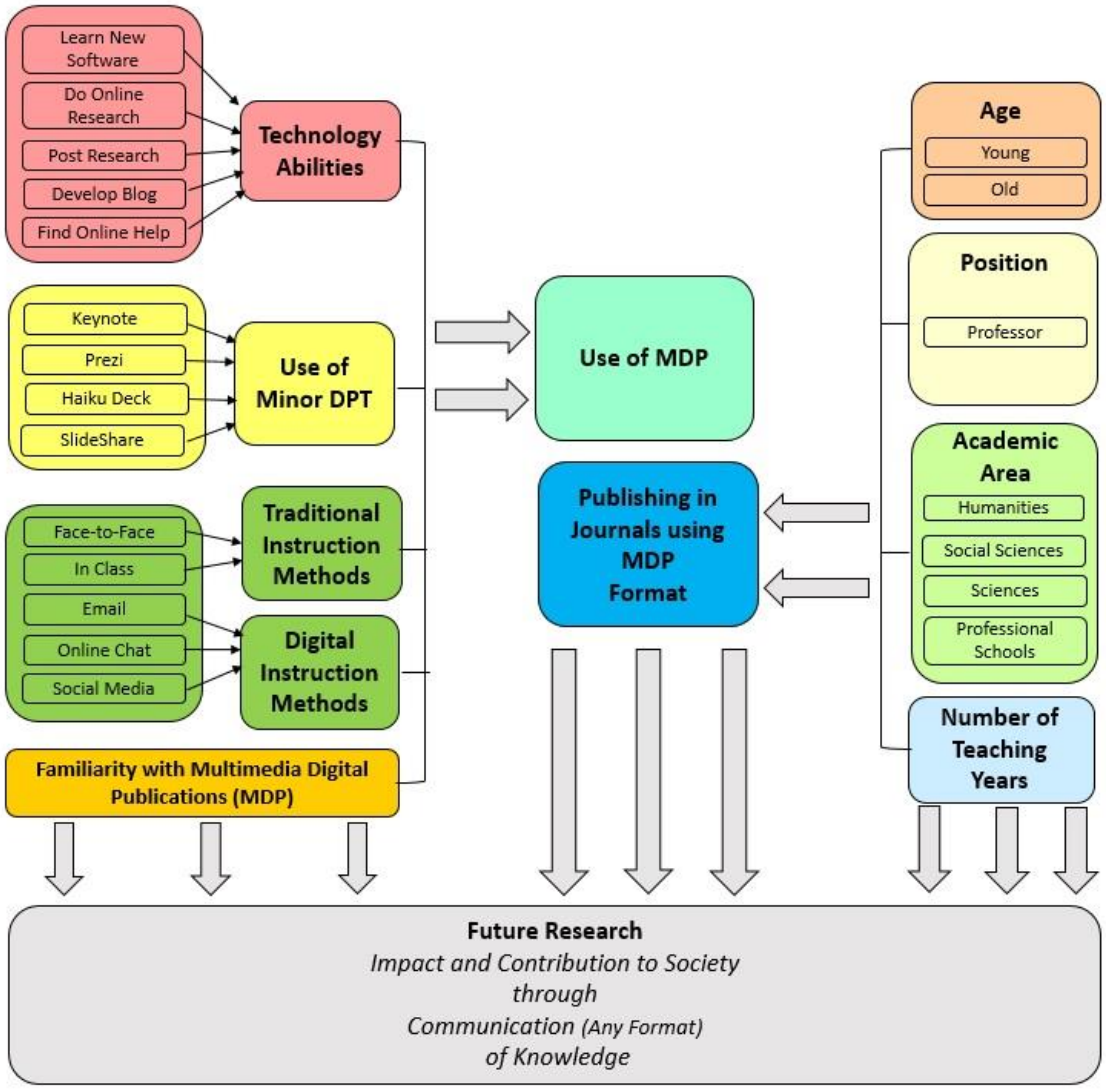


Figure 5-2. Revised Research Model for Digital Scholarly Communication

CHAPTER 6: CONCLUSIONS AND IMPLICATIONS

Conclusions of the Study

Then, why would it be important to ask what it means to be an educated person? One response to this hinges on an educator's notion of an 'educated person' to have an immediate and vital influence on the core curriculum and the necessary subjects to teach all students in higher education. Furthermore, the core curriculum directly links to their students' research papers as a product of scholarly communication practices in academia and these in turn are seen as valued by society. Then, does the core curriculum derive from the educators' notion of an 'educated person' address the central knowledge of the society itself or its culture? Do colleges or universities' core curricula reflect competency in the workplace and does it prepare students to be career-ready? Does the content of higher education stay parallel to the needs of society?

As stated in the introduction, there are differing expectations for students' ICT literacy skills between human resources consultants and business school faculty (Ali & Katz, 2010). There are also criticisms that higher education is not preparing their students for the workplace to be competent in contributing to society as an educated individual. Although Hutchins (1936b) who created a radically different curricular model for The University of Chicago stated "learning at the college level should have no vocational aim," this was well before the Millennium and the impact of a changing multimedia digital era. The definition of an educated person continues to evolve over time, and the core curriculum of the higher education may also need to be reflected by conveying various scholarly communications in a multimedia digital environment.

What would educators expect of a person who will be considered ‘educated’ in a changing multimedia era? As mentioned earlier, perhaps there is no universal definition of what constitutes an educated person today. But again, on the basis of this research study, the following three things might be included in defining an educated person on a broader level: 1) knowledge, 2) communication of knowledge, and 3) impact and contribution to society through communication of knowledge. Further reflection of the time we live in would need to add the value of being an educated person in a digital age.

In particular, in the ‘communication of knowledge’ the format of communication should not be limited to print format since other packages are now available. It could be any format including audio, video, or other interactive digital presentation format. The wider use of graphic, sound, and multimedia will enhance various scholarly communications in disciplines of the humanities, social sciences, or professional areas beyond the medical and science areas. In addition, subject areas such as music and art are particularly appropriate for multimedia applications. Also, the broader use of modalities will parlay dynamic and interactive research into a more effectual communication of knowledge, especially when it is useful to present the processes involved in data collection and analysis as well as communicating research results. In addition, the open-ended approach to use multiple modalities will embrace wider learning groups who are less verbally-oriented such as students with dyslexia. These students have been ‘educated’ in a system which communicates using a medium that is counterproductive to their ability to grasp information accurately. Thus, changing modalities may help them in understanding content using an alternative perspective.

Furthermore, scholarly communication using any format could be linked to students' research activities using multimedia digital format. The research paper may become a research product using any format will emerge as a vehicle to communicate how students understood knowledge and how they are able to contribute to it. It is fascinating to see if the traditional research paper can survive in a digital, multimedia era.

Limitations and Assumptions

The sampling methodology used in this study places restrictions on the generality of results. The concern is that there might be sampling biases in this study from its recruitment of participants in a university. Accordingly, although professors, librarians, and teaching assistants are a major population, there may be institution, instruction, position, academic area, age limitations. A sampling frame for this type of study would need to consider all strata from each type of institution, from various populations, and from various stakeholders. Problems can develop when a researcher uses a convenience sample and compares groups that are not comparable. The focus of this preliminary investigation is hypothesis defining with the intention that its exploration can lead to a more extensive study with a large, random sample of potential respondents. Thus, the sampling methods of future studies might include a wider array of stakeholders with more representative, random samples of respondents. This will, in turn, allow for more straightforward comparability between the samples.

Furthermore, if there are controls for differences across institutions or information settings with a lager sample, then it might be assumed that individuals had the same opportunities to access multimedia digital publications (MDP) or digital presentation

tools (DPT). That restriction was not adhered to with the samples used in this investigation although respondents did indicate that knew of multimedia changes to scholarly publications. The translation of this to the classroom was less transparent. It was evident that TAs at the institution received instruction in teaching, which was not as readily available to professors or librarians. The university offers a center for online and hybrid learning which is available for those who seek it out. This center was not mentioned by any of the respondents in this study. Note that this center deals with the modes to deliver class instruction and not with the format of the scholarly work included on syllabi.

Future studies would need to be conscious of linking all opportunities available to respondents that are connected to the objectives of a research study. This would be necessary if actual prediction models are anticipated to determine what factors influence individuals' acceptance of multimedia in lieu of print documents. This might include replacing a term paper with a video presentation. Limitations in this study may have suffered from lack of a control group in an experimental setting. Such a model would require control over extraneous variables which might be accounting for acceptance of multimedia products. It is hoped that this study does provide the footings necessary to design such investigations. In fact, the qualitative comments of respondents provide valuable insights on how they view change in this area. More tenuous is the use of this study to define an educated person. It is likely that such a notion continues to evolve as new technologies usher in new ways to communicate knowledge. It is important to note that the tacit assumption of what constitutes an educated person needs full articulation today.

Future Research

Larger and Random Sample

It is planned that this study will continue and expand as part of a research program to explore the ways in which knowledge is communicated in a dynamic information environment. As stated in the limitations and assumptions section, the study posits the need for a larger and random sample from a number of different perspectives in order to collect representative data. Individuals can be randomly selected at different (randomly) selected colleges and universities. Ideally, and not considering cost, the sample will comprehensively include all strata from each population.

This study successfully identified a number of key variables associated with the actual use of and publication in multimedia digital publications (MDP). It suggested how each variable is progressively involved in accounting for unique variance as the model is built using blocks of data. This was augmented by qualitative comments regarding individuals' assessments of future directions in the communication of knowledge at the publication and learning stages. Future research will be conducted based on the identified variables to construct viable models of how research papers in any format may define what it means to be an educated person in the multimedia digital environment, and also would set the stage for a larger multi-level investigation.

Extended Methodology Research

The methodology of the research will be extended from the survey and in-depth personal interview to experiments, observations, diary methods, and focus-group (group

discussion) interviews. This represents a pragmatic approach based on extended research methods to provide a more comprehensive understanding of this research topic. Various research methods can be used to explore variable interactions and nonlinear patterns among the data. Not included here is the cognitive style preferred by individuals although this, too, may be an important contributor to the variance explained in multimedia publishing or learning. Hopefully, such models will address the details involved in specific and broader situations using particular multimedia research tools. It will need to encompass an understanding of the underlying reasons, motivations, and opinions why and how educators use digital presentation tools (DPT) and multimedia digital publications (MDP) for their teaching and research. In addition, this trajectory influences how those underlying findings will be affected by educators' notion of an 'educated person' in a changing multimedia era, and how their perceptions apply to their actual curriculum and subject content to be taught to students who, in turn, will then be considered as educated individuals in a society. Seen today is the tension between considering an educated person as someone who has experienced a core curriculum versus a student who is educated only to be ready for a particular career. The meta- and multi- research methods will be useful when developing appropriate, compatible models for a research program in this area.

Discipline Specific Research

This study reveals some educators' overall approach to using multimedia digital publication (MDP) for research and teaching across core academic areas. The research finding of this study reveals that professors in science areas publish more in MDP than

those in other academic areas and that the variables useful in predicting this are better defined. Yet, their experience in publishing in journals using MDP format does not directly link to their classroom practices for their students. It is possible that their practice in research is media specific when it comes to teaching. They may publish in a video journal and know its complexities which then inform them that it might be more efficient for students to use simpler tools. But this speculation and future research will be needed to uncover the reasons behavior in one area does not link to another area. Meanwhile, this study's findings also reveal that the younger generation is more likely to publish in MDP than the older generation. In addition, it appears that some educators' actual use of MDP are affected by their confidence of their own technology skills or their early adopter status such as more use of minor DPT (Keynote, Prezi, Haiku Deck, and SlideShare) and use of both traditional and digital instruction methods (face-to-face, in class, email, online chat, and social media).

Thus, in the future research, an experiment can isolate the teaching assistant groups (TA, the younger educator group in this study) in a science area. Using an experimental design, the study can compare the growth in students' learning using DPT and MDP between the TA group (randomly selected half) who do not use DPT and a comparable group of the other half who gets instruction of DPT for their teaching. Students in both control and treatment groups will take a pretest and a posttest. Growth in students' learning using DPT and MDP can measured by comparing scores on students' research papers with a presentation at the beginning of the semester of the school year and at the end of the school year. Then, it might eventually be seen how any initial difference has an impact on undergraduate students learning and how this may project

upward to influence their professors' research and teaching too.

Cross-Cultural Research

Future studies can also include diverse possibilities to develop research topics in cross-cultural research investigations. The research can aim to investigate both Western and Eastern educators' branding thoughts and examine the interrelation among three educator groups' branding dimensions and their joint impact on undergraduates learning outcomes through research products using different formats. For example, the study can reveal that how American and Korean educators have different and similar perceptions with respect to the effect of educators' research and teaching practices using multimedia digital format. This can then be assessed to see if it has a significant effect on students' learning outcome. The educators of different cultures may or may not perceive in the same way the impact of multimedia digital publications in scholarly communication.

Concluding Remarks

Here is the quotation from one of the survey respondents' definition of an educated person:

> To be able to develop a framework through which you can analyze material, particularly media created material, and find the relevant information to understand and hopefully contribute to a positive resolution of the issues facing yourself, your community, and the larger society.

Here is another quotation from one of the interviewee, Bonnie Firestein's definition of an educated person:

> I would say an educated person is – what defines an educated person is somebody who is knowledgeable about the world. I mean, it's great to be educated in one area, but when you just say: okay, Bonnie, what is an educated person? It's somebody who reads and questions, right? So you can read the newspaper and you can say you're educated, but often the newspaper is there to sell newspapers. So to be educated I think you have to ask questions and look at multiple sources to come up with what you believe to be true. So questioning is part of being educated, looking at multiple sources is part of being educated.
>
> And, I think being open minded is part of being educated. Understanding differences in people's opinions and differences in what people are coming – right, everybody comes to a situation or a question with different backgrounds and different experiences, and trying to understand those experiences. So I think it's beyond just: okay, you have a PhD, you're educated. I think an educated person is beyond that. They have to be flexible to new ideas and new ways of doing things.
>
> (Bonnie Firestein, biology and neuroscience professor)

These definitions of an educated person describe its meaning in a multimedia digital age, and also they are linked to the new role of academic librarians. Academic libraries can play a key role to improve students' critical thinking and open-minded learning through relevant library instructions and services.

As many scholars noted earlier, today's students are entering colleges and universities with a variety of experiences involving the Internet and information technologies. Yet again, not all digital learners can be declared as digitally literate. If there is no relevant instruction, students will struggle to evaluate critically the information they found to support positions and conclusions in their research papers. Even today's digitally literate students and also educators who teach those students need to be guided by the relevance of multimedia digital tools as an emerging and essential component of research.

In mentoring for this, academic libraries can play a pivotal role to improve students' learning through relevant library instructions while they collaborate with

professors to integrate information and communication technology (ICT) literacy into the universities' core curriculum. A successful collaboration would be expected to produce a seamless blend of a core subjects with research skills and also ICT literacy proficiencies as ideal ways to meet students' needs with full faculty support.

Educating academic librarians who will educate others using a digital literacy perspective independent of format can advance knowledge in an iSociety. It is hoped that academic librarians can be better-prepared to cope with the need for digitally literate students who can be guided by instructors to improve their ICT literacy skills in an educational environment evolving across a multimedia landscape. Then, academic librarians will also be able to integrate their knowledge with practical work in the field of library and information studies.

Meanwhile, an extensive application of multimedia modalities to scholarly communication seems counter to the model of research papers that has been in place for the past century. Given the explosive growth of multimedia content available for the wider use of scholarly communication, academic libraries will be challenged to migrate from print to electronic collections in providing unified access to research. This, in turn, may force a redesign of the model now in place for academic libraries. It is hoped that a new scholarly communication model will provide a useful roadmap for academic libraries and the faculty and students they serve.

Ultimately, educators would want our 'educated' students to have a beneficial impact on our society through communication of knowledge as we progress to a dynamic multimedia digital environment. Also, the final goal of this study is to advance our knowledge of how information and communication technology literacy may define an

educated person in our society, and to contribute to developing and supporting our society through scholarly communication of this knowledge. As a hub of the scholarly communication, academic librarians will play a pivotal role to improve students' learning through relevant information literacy instruction and effective library services.

APPENDICES

Appendix A. Consent Form for Survey

Principal Investigator: GoUn Kim
Project Title: The Research Paper in the Digital Age

INFORMED CONSENT FORM

for participation in a **survey** study on
an exploration dealing with the academic research paper

You are invited to participate in a research study that is being conducted by GoUn Kim, who is a Ph.D. candidate in the Library and Information Science Department at Rutgers University. The purpose of this research is to understand how people perceive and evaluate in changes to research papers according to the passing of time.

Approximately 150 subjects between the ages of 21 and 75 years old will participate in the study, and each individual's participation will last approximately 30 minutes to complete (depending on amount of detail provided in the open-ended questions).

Participation in this study will involve the following: "Yes/No" questions, Likert-type scales, and open ended questions which mainly consists of perception and evaluation of research papers in the past, present, and future.

This research is confidential. Confidential means that the research records will include some information about you and this information will be stored in such a manner that some linkage between your identity and the response in the research exists. Some of the information collected about you includes age, gender, and job title. We will keep this information confidential by limiting individual's access to the research data and keeping it in a secure location in the Principal Investigator's computer database with access locks (security code). It is accessible only to the Principal Investigator.

The research team and the Institutional Review Board at Rutgers University are the only parties that will be allowed to see the data, except as may be required by law. If a report of this study is published, or the results are presented at a professional conference, only group results will be stated. All study data will be kept for five years.

There are no foreseeable risks to participation in this study.

Participation in this study is voluntary. You may choose not to participate, and you may withdraw at any time during the study procedures without any penalty to you. In addition, you may choose not to answer any questions with which you are not comfortable.

If you have any questions about the study or study procedures, you may contact myself at gounkim@rutgers.edu / 201-888-2567 or you can contact my advisor Daniel O. O'Connor at dan.oconnor@rutgers.edu / 848-932-8790

If you have any questions about your rights as a research subject, you may contact the IRB Administrator at Rutgers University at:

Rutgers University, the State University of New Jersey
Institutional Review Board for the Protection of Human Subjects
Office of Research and Sponsored Programs
3 Rutgers Plaza
New Brunswick, NJ 08901-8559
Tel: 848-932-0150
Email: humansubjects@orsp.rutgers.edu

You will be given a copy of this consent form for your records.

Sign below if you agree to participate in this research study:

Subject (Print) _____

Subject Signature _____ Date _____

Principal Investigator Signature _____ Date _____

Appendix B. Consent Form for Interview

Principal Investigator: GoUn Kim
Project Title: The Research Paper in the Digital Age

INFORMED CONSENT FORM

for participation in an **interview** study on
an exploration dealing with the academic research paper

You are invited to participate in a research study that is being conducted by GoUn Kim, who is a Ph.D. candidate in the Library and Information Science Department at Rutgers University. The purpose of this research is to understand how people perceive and evaluate in changes to research papers according to the passing of time.

Approximately 16 subjects between the ages of 21 and 75 years old will participate in the study, and each individual's participation will last approximately 30 minutes.

This interview takes place for those who agree for follow-up information based on open-ended responses. If you agree then your quoted comments might be attributed to you by name. The study procedures include a few questions about your experience and perspective on research papers.

This research is confidential. Confidential means that the research records will include some information about you and this information will be stored in such a manner that some linkage between your identity and the response in the research exists. Some of the information collected about you includes name, age, gender, and job title. We will keep this information confidential by limiting individual's access to the research data and keeping it in a secure location in the Principal Investigator's computer database with access locks (security code). It is accessible only to the Principal Investigator.

The research team and the Institutional Review Board at Rutgers University are the only parties that will be allowed to see the data, except as may be required by law. If a report of this study is published, or the results are presented at a professional conference, only group results will be stated. All study data will be kept for five years.

There are no foreseeable risks to participation in this study.

Participation in this study is voluntary. You may choose not to participate, and you may withdraw at any time during the study procedures without any penalty to you. In addition, you may choose not to answer any questions with which you are not comfortable.

If you have any questions about the study or study procedures, you may contact myself at gounkim@rutgers.edu / 201-888-2567 or you can contact my advisor Daniel O. O'Connor at dan.oconnor@rutgers.edu / 848-932-8790

If you have any questions about your rights as a research subject, you may contact the IRB Administrator at Rutgers University at:

Rutgers University, the State University of New Jersey
Institutional Review Board for the Protection of Human Subjects
Office of Research and Sponsored Programs
3 Rutgers Plaza
New Brunswick, NJ 08901-8559
Tel: 848-932-0150
Email: humansubjects@orsp.rutgers.edu

You will be given a copy of this consent form for your records.

Sign below if you agree to participate in this research study:

Subject (Print) _____

Subject Signature _____ Date _____

Principal Investigator Signature _____ Date _____

Appendix C. Consent Form for Audiotape

AUDIO ADDENDUM TO CONSENT FORM

You have already agreed to participate in a research study entitled "The Research Paper in the Digital Age" conducted by GoUn Kim. We are asking for your permission to allow us to audiotape as part of that research study. You do not have to agree to be recorded in order to participate in the main part of the study.

The recording(s) will be used for analysis by the research team.

The recording(s) will include your name and job title.

The recording(s) will be stored in a locked file cabinet and labeled with your name or other identifiable information and will be destroyed upon publication of study results.

Your signature on this form grants the investigator named above permission to record you as described above during participation in the above-referenced study. The investigator will not use the recording(s) for any other reason than that/those stated in the consent form without your written permission.

Subject (Print) _____

Subject Signature _____ Date _____

Principal Investigator Signature _____ Date _____

Appendix D: Survey Questionnaire

[* : The words are interchangeable according to corresponding participants—professor, librarian, and teaching assistant.]

Dear Rutgers *Professor, [*Librarian] or [*Teaching Assistant]

This study invites you to participate in an exploration dealing with the academic research paper. The study includes individuals' past, present, and expected experiences with the research paper as a vehicle of scholarly communication. Your assessments will be used to assist in a broader understanding of how individuals perceive and evaluate changes to research papers over time.

If you would like additional information regarding this study, including results, before or after its completion, please feel free to contact me. This study is completely voluntary and anonymous, and you can terminate your participation at any time.

In this study, a "digital research paper" is defined as a product that goes beyond traditional text or text with graphic images on paper to include new digital formats such as PowerPoint, website, video, sound, and other digital presentation tools.

Thank you!
Ph.D. Candidate GoUn Kim
gounkim@rutgers.edu

Instructions: Please respond with your best judgment regarding each of the following items. If you do not know a precise answer, please give your best guess. If you experience any difficulty in using the online survey then please indicate that in the Comments area or contact me directly.

If you disagree, or do not wish to participate, then please exit this survey now. If you are over 18 years old, and understand that by clicking below you give your informed consent to participate in this study, then please click below.

❍ I agree

How would you classify your general academic area?

❍ Humanities
❍ Social Sciences
❍ Sciences
❍ Professional Schools

How familiar are you with multimedia digital publications?

	Don't Know 0	Less Familiar 1	2	3	4	5	6	7	8	9	More Familiar 10
Digital Publications	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

How often do you use multimedia digital publications?

	Don't Use 0	Rarely Use 1	2	3	4	5	6	7	8	9	Often Use 10
Digital Publications	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

How familiar are you with the following digital presentation tools?

	Don't Know 0	Less Familiar 1	2	3	4	5	6	7	8	9	More Familiar 10
PowerPoint	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Keynote	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Prezi	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Haiku Deck	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
SlideShare	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Video (or YouTube)	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Website	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

Please specify if you know of any other digital presentation tools or if you have comments on the above.

How often do you use the following digital presentation tools?

	Don't Use 0	Rarely Use 1	2	3	4	5	6	7	8	9	Often Use 10
PowerPoint	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Keynote	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Prezi	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Haiku Deck	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
SlideShare	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Video (or YouTube)	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Website	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

Please specify if you use any other digital presentation tools or if you have comments on the above.

How confident are you in your ability to:

	Cannot Do 0	Probably Cannot Do 1	2	3	3	4	5	6	7	8	9	Definitely Can Do 10
Learn New Software	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Do Online Research	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Post and Publish My Research On the Internet	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Develop a Blog or Website	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Find Help with a Technology Problem Online	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

Part I. When You were an Undergraduate Student

Print Research Papers

How important are the following components when constructing a print research paper when you were an undergraduate student?

	Not Applicable 0	Less Important 1	2	3	4	5	6	7	8	9	More Important 10
Topic	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Content	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Organization	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Clarity and Style	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Visual Aids (Graphs, Images, Pictures)	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Number of References	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Length (Pages)	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Timely Submission	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Ethics	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

Digital Research Papers (PowerPoint, Video, Website, Prezi, etc.)

When you were an undergraduate, how often did you construct digital research papers?Please give us approximate number of digital research papers you produced as an undergraduate student (if never, use zero).

How important are the following components when constructing a digital research paper when you were an undergraduate student?

	Not Applicable 0	Less Important 1	2	3	4	5	6	7	8	9	More Important 10
Topic	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Content	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Organization	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Clarity and Style	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Visual Aids (Graphs, Images, Pictures, Flash, Moving Images, Video, etc.)	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Number of References	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Length (Slides, Minutes, etc.)	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Timely Submission	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Ethics	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

In the space below, please share any additional comments regarding research papers (topic, content, format, etc.) when you were an undergraduate student.

Part II. When You were a Graduate Student

Print Research Papers

How important are the following components when constructing a print research paper when you were a graduate student?

	Not Applicable 0	Less Important 1	2	3	4	5	6	7	8	9	More Important 10
Topic	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Content	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Organization	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Clarity and Style	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Visual Aids (Graphs, Images, Pictures)	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Number of References	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Length (Pages)	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Timely Submission	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Ethics	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

Digital Research Papers (PowerPoint, Video, Website, Prezi, etc.)

When you were a graduate, how often did you construct digital research papers? Please give us approximate number of digital research papers you produced as a graduate student (if never, use zero).

How important are the following components when constructing a digital research paper when you were a graduate student?

	Not Applicable 0	Less Important 1	2	3	4	5	6	7	8	9	More Important 10
Topic	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Content	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Organization	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Clarity and Style	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Visual Aids (Graphs, Images, Pictures, Flash, Moving Images, Video, etc.)	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Number of References	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Length (Slides, Minutes, etc.)	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Timely Submission	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Ethics	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

In the space below, please share any additional comments regarding research papers (topic, content, format, etc.) when you were a graduate student.

Part III. Now When You Evaluate Research Papers as a *Professor, [*Librarian] or [*Teaching Assistant]

Print Research Papers

How important are the following components to today's students when constructing a print research paper?

	Not Applicable 0	Less Important 1	2	3	4	5	6	7	8	9	More Important 10
Topic	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Content	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Organization	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Clarity and Style	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Visual Aids (Graphs, Images, Pictures)	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Number of References	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Length (Pages)	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Timely Submission	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Ethics	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

Digital Research Papers (PowerPoint, Video, Website, Prezi, etc.)

How important are the following components to today's students when constructing a digital research paper?

	Not Applicable 0	Less Important 1	2	3	4	5	6	7	8	9	More Important 10
Topic	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Content	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Organization	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Clarity and Style	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Visual Aids (Graphs, Images, Pictures, Flash, Moving Images, Video, etc.)	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Number of References	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Length (Slides, Minutes, etc.)	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Timely Submission	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Ethics	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

How long have you been instructing/ teaching students? Please indicate the number of years.

How often do you instruct students?

	Don't Do 0	Rarely Do 1	2	3	4	5	6	7	8	9	Often Do 10
Face-to-Face (One-to-One) Instruction	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
In Class Instruction	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Email Instruction	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Online Chat Instruction	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Social Media Instruction	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

In the space below, please share any additional comments regarding research papers (topic, content, format, etc.) when you evaluate students' research papers as a professor.

Part IV. In the Next Five Years

Print Research Papers

How important might the following components be to students in the future when constructing a print research paper?

	Not Applicable 0	Less Important 1	2	3	4	5	6	7	8	9	More Important 10
Topic	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Content	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Organization	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Clarity and Style	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Visual Aids (Graphs, Images, Pictures)	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Number of References	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Length (Pages)	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Timely Submission	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Ethics	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

Digital Research Papers (PowerPoint, Video, Website, Prezi, etc.)

How important might the following components be to students in the future when constructing a digital research paper?

	Not Applicable 0	Less Important 1	2	3	4	5	6	7	8	9	More Important 10
Topic	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Content	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Organization	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Clarity and Style	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Visual Aids (Graphs, Images, Pictures, Flash, Moving Images, Video, etc.)	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Number of References	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Length (Slides, Minutes, etc.)	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Timely Submission	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Ethics	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

In the space below, please share any additional comments regarding changes in research papers (topic, content, format, etc.) in the next five years.

Have you had one or more articles published in any journals using multimedia digital formats (ex. PowerPoint, video, website, etc.)?

- ❍ Yes
- ❍ No

Please give us approximate number of digital articles or papers you produced, not just online ones but truly multimedia digital products (if never, use zero).

Are you experienced in giving assignments to students using multimedia digital formats as their research papers (ex. PowerPoint, video, website, etc.)?

- ❍ Yes
- ❍ No

Your General Opinion:

What does it mean to be an educated person?

Who is a digitally literate person in the digital age?

How prevalent is the practice of replacing a written research paper with a multimedia presentation?

Gender

- ❍ Male
- ❍ Female

Age

- ❍ 21-25
- ❍ 26-30
- ❍ 31-35
- ❍ 36-40
- ❍ 41-45
- ❍ 46-50
- ❍ 51-55
- ❍ 56-60
- ❍ 61 or more

Please indicate the number of degrees earned in each category below

_____ Bachelors
_____ Masters
_____ Doctoral

Please provide additional education or certification information in the space below.

Appendix E: Interview Questionnaire

- How do you perceive changes in research papers over time?
  - What was your experience with research papers when you were an undergraduate student and a graduate student?
  - What changes have occurred in the past five years?
  - What are your current practices with research papers or equivalent requirements?
  - What changes might be expected in the next five years?

- How familiar are you with multimedia digital publications and digital presentation tools?

- Have you ever given an assignment for students to use multimedia digital formats as a research paper equivalent?

- How do you evaluate content in each of the two format? Is the evaluation of digital research papers different from print research papers?

- How do you evaluate student performance? What percentage of each categories are apply for student performance: test, research paper, PowerPoint presentation (or multimedia digital product)?

- When you evaluate student performance, what changes might be expected in the next five years?

- How do you instruct students and faculty in the availability of multimedia digital publications?

- Please explain any experiences you have had with preparing information for publication using a multimedia digital format.

- How would you compare this experience to a text-based publication which appears as printed paper?

- Have you ever published an article in any journals using multimedia digital formats?
    - If yes, how many articles have you published using multimedia digital formats and could you tell me your experience?
    - If no, are you willing to publish an article using multimedia digital formats in the near future?

- Please give your opinion or thought about:
    - What does it mean to be an educated person?
    - Who is a digitally literate person in the digital age?
    - How prevalent is the practice of replacing a written research paper with a multimedia presentation?

Appendix F. Institutional Research Board Approvals (Initial)

RUTGERS UNIVERSITY
Office of Research and Sponsored Programs
ASB III, 3 Rutgers Plaza, Cook Campus
New Brunswick, NJ 08901

August 1, 2014

P.I. Name: Kim
Protocol #: 14-795M

Go Un Kim
Library and Information Science
4 Huntington Street
New Brunswick NJ 08901-

Dear Go Un Kim:

✓
(Initial / Amendment / Continuation / Continuation w/ Amendment)

Protocol Title: "The Term Paper in the Digital Age"

This is to advise you that the above-referenced study has been presented to the Institutional Review Board for the Protection of Human Subjects in Research, and the following action was taken subject to the conditions and explanations provided below:

Approval Date:	7/20/2014	**Expiration Date:**	7/19/2015
Expedited Category(s):	7	**Approved # of Subject(s):**	60

This approval is based on the assumption that the materials you submitted to the Office of Research and Sponsored Programs (ORSP) contain a complete and accurate description of the ways in which human subjects are involved in your research. The following conditions apply:

- **This Approval-**The research will be conducted according to the most recent version of the protocol that was submitted. **This approval is valid ONLY for the dates listed above;**
- **Reporting-**ORSP must be immediately informed of any injuries to subjects that occur and/or problems that arise, in the course of your research;
- **Modifications-**Any proposed changes MUST be submitted to the IRB as an amendment for review and approval prior to implementation;
- **Consent Form(s)-**Each person who signs a consent document will be given a copy of that document, if you are using such documents in your research. The Principal Investigator must retain all signed documents for at least three years after the conclusion of the research;
- **Continuing Review-**You should receive a courtesy e-mail renewal notice for a Request for Continuing Review before the expiration of this project's approval. However, it is your responsibility to ensure that an application for continuing review has been submitted to the IRB for review and approval prior to the expiration date to extend the approval period;

Additional Notes: **Expedited Approval per 45 CFR 46.110;**

Failure to comply with these conditions will result in withdrawal of this approval.
Please note that the IRB has the authority to observe, or have a third party observe, the consent process or the research itself. The Federal-wide Assurance (FWA) number for the Rutgers University IRB is FWA00003913; this number may be requested on funding applications or by collaborators.

Respectfully yours,

Acting For--
Dr. Beverly Tepper, Ph.D.
Professor
Chair, Rutgers University Institutional Review Board

cc: Dr. Daniel O'Connor

(FA:bk)

Appendix G. Institutional Research Board Approvals (Continuation with Amendment)

RUTGERS

Office of Research and Regulatory Affairs
Arts and Sciences IRB
Rutgers, The State University of New Jersey
335 George Street / Liberty Plaza / Suite 3200
New Brunswick, NJ 08901

orra.rutgers.edu/artsci
732-235-9806

August 6, 2015

GoUn Kim
4 Huntington Street
New Brunswick NJ 08901-

P.I. Name: Kim
Protocol #: 14-795M

Dear GoUn Kim:

Initial	Amendment	Continuation	Continuation w/ Amend	Adverse Event
			X	

Protocol Title: "The Research Paper in the Digital Age"

This is to advise you that the above-referenced study has been presented to the Institutional Review Board for the Protection of Human Subjects in Research, and the following action was taken subject to the conditions and explanations provided below:

Approval Date: 7/20/2015 **Expiration Date:** 7/19/2016
Expedited Categories: 6,7 **Approved # of Subject(s):** 150 **Currently Enrolled:** 135

This approval is based on the assumption that the materials you submitted to the Office of Research and Sponsored Programs (ORSP) contain a complete and accurate description of the ways in which human subjects are involved in your research. The following conditions apply:

- **This Approval**-The research will be conducted according to the most recent version of the protocol that was submitted. **This approval is valid ONLY for the dates listed above;**
- **Reporting**-ORSP must be immediately informed of any injuries to subjects that occur and/or problems that arise, in the course of your research;
- **Modifications**-Any proposed changes MUST be submitted to the IRB as an amendment for review and approval prior to implementation;
- **Consent Form(s)**-Each person who signs a consent document will be given a copy of that document, if you are using such documents in your research. The Principal Investigator must retain all signed documents for at least three years after the conclusion of the research;
- **Continuing Review**-You should receive a courtesy e-mail renewal notice for a Request for Continuing Review before the expiration of this project's approval. However, it is your responsibility to ensure that an application for continuing review has been submitted to the IRB for review and approval prior to the expiration date to extend the approval period;

Additional Notes:	▪ **Continuation with Amendment Expedited approval per 45 CFR 46.110** ▪ **Amendment: 1) Title changed to "The Research Paper in the Digital Age"; 2) Added new questions and reordered questions in the survey and interview; 3) Increased the # of subjects to be enrolled to 150; 4) Corrected typo in PI's name.** ▪ **HSCP Certification will no longer be accepted after 7/1/15 (including for anyone previously grandfathered). CITI becomes effective on July 1, 2015 for all Rutgers faculty/staff/students engaged in human subjects research.**

Failure to comply with these conditions will result in withdrawal of this approval.
Please note that the IRB has the authority to observe, or have a third party observe, the consent process or the research itself. The Federal-wide Assurance (FWA) number for the Rutgers University IRB is FWA00003913; this number may be requested on funding applications or by collaborators.

Respectfully yours,

Acting For--
Beverly Tepper, Ph.D.
Professor, Department of Food Science
IRB Chair, Arts and Sciences Institutional Review Board
Rutgers, The State University of New Jersey

cc: Dr. Daniel O'Connor

(MW:nh)

Appendix H. Invitation Email for Survey

Subject: Invitation to address what it means to be an educated person in a multimedia digital environment

From: GoUn Kim
To: Individual sending to each person in each of the three groups

Dear [Respondent Name]:

My dissertation research addresses an aspect what it means to be an educated person in our society within a multimedia digital environment.

You have been selected with the help of my advisor, Prof. Dan O'Connor, as someone who might help shed light on this topic. The sample for this research includes professors, teaching assistants, and librarians. Each response is important and it is hoped that you will be able to spend about 30 minutes to respond to a questionnaire whose link is provided below.

This study has received approval from IRB at Rutgers and this is fully explained in the questionnaire.

Please let me know if you have any questions about this research.

Follow this link to the Survey:
${l://SurveyLink?d=Take the Survey}

Or copy and paste the URL below into your internet browser:
${l://SurveyURL}

Thank you,

GoUn Kim, Ph.D. Candidate
Name of the Department
Email Contact

Appendix I. Reminder Email for Survey

Subject: [Reminder] Invitation to address what it means to be an educated person in a multimedia digital environment

From: GoUn Kim
To: Individual sending to each person in each of the three groups

Dear [Respondent Name]:

Recently you should have received a survey from GoUn Kim, Ph.D. Candidate at Rutgers University, and her advisor Dan O'Connor requesting your input on a research study to understand how people perceive and evaluate changes to research papers in a multimedia digital environment. The survey poses issues on how these changes may impact our understanding of what it means to be an educated person in our society.

Here is the link to the online survey:

Follow this link to the Survey:
${l://SurveyLink?d=Take the Survey}

Or copy and paste the URL below into your internet browser:
${l://SurveyURL}

This is a courtesy reminder to complete the above mentioned survey. Your participation in this study is very important and will be greatly appreciated. You are assured of strict confidentiality as only summary results will be reported. If you have any question or concern regarding this research study, please send email GoUn Kim at *email address.*

Thank you very much for your cooperation and assistance in this very important research study.

Best,

GoUn Kim, Ph.D. Candidate
Name of the Department
Email Contact

Appendix J. Invitation Email for Interview

Subject: Invitation for Interview: Research papers & what it means to be an educated person in a multimedia digital environment

From: GoUn Kim
To: Individual sending to each person in each of the three groups

Dear [Individual Interviewee's Name]:

Thank you for sharing your thoughts about the link between research term papers and what it means to be an educated person in a multimedia digital environment. I would like to do a follow-up interview with you to tell me a little more about your experience and opinion regarding this research topic. The interview will last about 30 minutes.

For your information, if you agree then your quoted comments also may, with your permission, be attributed to you by name in my dissertation.

I would be grateful if you could indicate a convenient time and place to see me for the interview.

If you have any question or concern regarding this research study, please send email GoUn Kim at *email address.*

Looking forward to meeting you.

Best,

GoUn Kim, Ph.D. Candidate
Name of the Department
Telephone and Email Contact

Appendix K. Reminder Email for Interview

Subject: [Reminder] Invitation for Interview: Research papers & what it means to be an educated person in a multimedia digital environment

From: GoUn Kim
To: Individual sending to each person in each of the three groups

Dear [Individual Interviewee's Name]:

I hope this email finds you well. I'm sending this note as a reminder to invite you for an interview related to the questionnaire you responded to as part of my dissertation research. I am awaiting your reply regarding this matter.

First, thank you for completing our survey and sharing your thoughts about the link between research term papers and what it means to be an educated person in a multimedia digital environment. I would like to do a follow-up interview with you to tell me a little more about your experience and opinion regarding this research topic.

I would be grateful if you could indicate a convenient time and place where I might interview you.

For your information, if you agree then your quoted comments may, with your permission, be attributed to you by name in my dissertation.

If you have any question or concern regarding this research study, please send email GoUn Kim at *email address.*

Looking forward to meeting you.

Best,

GoUn Kim, Ph.D. Candidate
Name of the Department
Telephone and Email Contact

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