The Problem of Multimodality:
What Data-Driven Research Can Tell Us
About Online Writing Practices

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ABSTRACT

. This article investigates the writing mode, multimodal aspects, and folksonomic elements of digital composition gathered from a WordPress-based ePortfolio platform.* Focusing on the student perspective, data was gathered through both surveys of first year students and text analysis of digital compositions in order to produce quantitative results that can be replicated and aggregated. This research demonstrates the impact of assignment design and platform affordances on student composition practices. Results show that incoming students do not fit the "digital native" myth, nor are they prepared to engage in digital scholarship at the college level without significant guidance and specific requirements that scaffold digital work.

Categories and Subject Descriptors

H.0 Information Systems: General

General Terms

Documentation, Design

Keywords

Pedagogy, multimodality, data, coding, composition, ePortfolios

INTRODUCTION

The pedagogical application of digital writing, specifically requiring students to compose in open, online spaces, has grown steadily over the last two decades along with a rise in institutional and financial support. Course management systems, virtual learning environments, and ePortfolio platforms designed for multi-user collaboration and consideration are among such online spaces that are increasingly used for educational purposes. While educators continue to reevaluate underlying assumptions about student writing in online open spaces, they need evidence to determine if and how students are using the affordances of digital platforms. This study was designed to provide "RAD research" – or replicable, aggregable, and data-supported (Haswell, 2005) – in order to ground the assumptions made about online writing pedagogy in tangible results.

Within this context, ePortfolios offer a particularly advantageous area of exploration for this research since they often hold vast archives of student writing along with relevant pedagogical materials. This study focuses on the use of WordPress as an ePortfolio platform at Macaulay Honors College, an elite program spanning eight of the twenty-four City University of New York (CUNY) campuses; however, the research questions are applicable across institutional contexts. The guiding questions for this study are as follows:

- How prepared are college students to compose in online, open spaces for educational purposes? How does their previous personal experience with digital technology impact their ability to develop digital literacy skills in higher education?

- What are the characteristics of student writing in online, open spaces? How does the interface/platform impact the writing students compose in that space?

- How does assignment design (i.e. the language used, the objectives, and/or the criteria) shape the resulting student work?

- How are these characteristics similar and different in writing across the disciplines? Specifically, how do they compare

when the subject or content of the writing emanates from humanities/art courses and from science/technology courses?

The results presented here are intended to inform administrators and instructors who work in writing studies or instructors across the disciplines that wish to integrate digital writing platforms into their courses more effectively.

This article offers both language and data to use when making arguments for campus-wide support of online writing programs. By providing evidence indicating that explicit instruction needs to be accompanied by formal requirements, this article concludes with specific actions instructors can take in order to guide students through the process of responsibly and reflectively incorporating multimedia into their writing. Supported by testimonials and verified by close readings, this article demonstrates how to structure a data-driven inquiry into a born-digital archive of student writing. In so doing, it supports the validity of computational analysis of student-produced work.

LITERATURE REVIEW

There are a host of constituent assertions that support the use of open online writing platforms in college-level courses. These claims include that writing in public venues cultivates digital literacy through broader audience awareness, facilitates interactivity and collaboration between peers, and supports the creation and integration of multimedia artifacts into the writing process (Stevenson, 2006; Yancey, 2015; Shipka, 2011; Palmeri, 2012). This article seeks to address the validity of those claims, specifically the impact of assignment design and platform-specific affordances on student composition practices, by examining the writing mode, multimodal aspects, and folksonomic elements of digital composition at Macaulay Honors College (commonly called Macaulay).

Process Theory

Grounded in process theory and constructivist pedagogy, this study examines the mode of writing and the multimodal elements of student composition in both low and high stakes assignments (Elbow, 1997) across general education seminars in the humanities and sciences. Peter Elbow defines this distinction as follows: low stakes assignments are personal, and not weighted heavily in terms of assessment, where as high stakes writing is formal, written for an outside audience, and assessed as a significant portion of the final grade for the course. The reason for examining a variety of assignments from each course emphasizes the dedication to value process over a final product. For the purposes of this article, the origins of process theory stem mainly from "Writing as a Process Not Product," (1972) wherein Donald Murray advocates for the move toward evaluating a student's oeuvre over the course of a semester, rather than hinging assessment on a final exam, project, or writing assignment. In this way, process theory and portfolio pedagogy have always been linked, dating back to the first wide-scale portfolio program started by Peter Elbow and Pat Belanoff at SUNY-Stony Brook in the 1980s.

Portfolio Pedagogy

As an alternative to high stakes testing, portfolio design aimed to present writing as a recursive process, and therefore assessed development through a variety of student-produced artifacts framed by reflection. As portfolio programs increased in popularity – and indeed a recent survey found that 50% of institutions of higher education use some form of portfolio (Yancey, 2016) – there was a need to assess the efficacy of this approach.

Since the archive of writing used as data for this study is contained in an ePortfolio system, studies on student writing based on process pedagogy served as a model for this study, beginning with the work of Janet Emig and Sondra Perl in the 1970s. Claiming that proof of a writing process gleaned from anecdotal conversation with professional writers was idiosyncratic at best, Janet Emig's work attempts to address the dearth of research on student writing. Therefore, in The Composing Processes of Twelfth Graders (1971), Emig systematically observes eight twelfth grade student writers, collecting data on their composition techniques while they describe their writing process out loud, and then analyzes the autobiographical essays they produce. As a result Emig establishes two modes of academic writing which serve as a basis for this research project: the reflexive mode, which is personal, introspective, and experiential, and the extensive mode, defined as analytical, objective, and informative.

This study updates Emig's model by applying the terms and methods to a much larger set of born-digital student compositions gleaned from an undergraduate program. In the ubiquitous computing era, the paper-based practice of portfolio pedagogy has largely moved to online spaces due to the logical affordances digital platforms can offer in terms of disseminating, organizing, and archiving student work. Emig's original definitions needed to be updated to match the particular dynamics on the digital space. In an online forum, reflexive writing has a wider potential audience, and therefore even personal writing can be read by anyone with access to the site. In fact, the public forum fundamentally changes the rhetorical situation of the composition.

Bringing this form of reflexive student writing to a public, online forum, expands the audience to include the college community, family and friends, and future employers, but also enables the writing to be read by the world at large. In the coding phase of research, low and high stakes posts were coded as either reflexive or extensive based on this modified definition that acknowledged both modes are written for an outside audience. This method is intended to identify how students address audience awareness in their online writing, and to assess disciplinary differences in the mode of writing students employ in both low and high stakes assignments.

Digital Literacy

Unlike paper portfolio assessment, which concentrates solely on writing skills, the evaluation of an ePortfolio should also address web-based skills. To emphasize what Jason Palmeri terms the "multimodal turn" in rhetoric, this study considers the cultivation of technological fluency specifically through the use of WordPress in a general education curriculum (2012). In addition to the mode of writing, student compositions were coded for various multimodal and folksonomic elements, such as their use of images, videos, tags, or categories. For the purposes of this study, folksonomy is broadly defined as an informal taxonomy implemented by users through tags, categories, or commenting. The goal is to identify elements that increase the accessibility and "findability" of information. These elements were chosen as evidence that students are engaged in building "digital literacy," defined by Paul Gilster as "critical selection and evaluation" and "reflective competence" rather than "purely technical skills" (1998).

In order to assess digital literacy as a practice it is important to understand the level at which students entered the program. As Kathleen Yancey (2009), past president of the National Council of Teachers of English, writes in "Writing in the 21st Century: A Report from NCTE": "[w]ith digital technology and, especially Web 2.0, it seems, writers are *everywhere*," and that "[o]pportunities for composing abound—on MySpace and Facebook and Googledocs and multiple blogs and platforms—and on national media sites, where writers upload photos and descriptions, videos and personal accounts, where they are both recipients and creators of our news" (pp. 4-5).Yancey claims that in the 21st century students are constantly creating multimodal compositions in digital spaces, although the range of venues may be more limited than Yancey suggests.

As a response to Yancey's call for more research on the composing strategies of 21st century students, the authors of "Revisualizing Composition: How First-Year Writers Use Composing Technologies" (Moore et al., 2016) conducted an extensive study of the composition habits of 1,366 students from seven colleges and universities. Statistics cited in the article show that "[s]tudents regularly use a range of technologies when composing, but they—not surprisingly—use them for different purposes." More importantly, the researchers conclude that "[w]e need new models of composing and new pedagogies for teaching writing, because as the following results show, students have much more fluid ways of using composing technologies than we typically acknowledge in our writing pedagogies" (Moore el al., 2016). The survey of Macaulay students provides the same insight into the composing practices of a small subset of college students.

The Digital Native Myth

In order to better understand this population, the Macaulay survey (2004) was informed by Maura Smale and Mariana Regalado's report (2014) on the use of Information and Communication Technologies (ICT) by students at six of the CUNY campuses. In their article "Commuter Students Using Technology," Smale and Relgalado report that while "[d]espite constant connection to friends and family via text messaging and social networks, students' experience of and preparation for using technology in their academic work was uneven — not just in their online research skills but also in their proficiency with basic productivity, word-processing, and presentation software" (2014). Additionally, recent scholarship on social media use, such as It's Complicated: The Social Lives of Networked Teens by danah boyd (2014) and "Examining Digital Literacy Practices on Social Network Sites" by Amber Buck (2012), debunk the "digital native" myth. Although the findings confirm that majority of American teenagers have social media accounts, boyd and Buck argue that many have a very limited understanding of those platforms and struggle to translate those skills into an academic context.

Both of these texts argue that many educators – and in fact society as a whole – wrongly assume that so called "millennials" have innate digital literacy skills. However, based on extensive interviews with teenagers across the country, boyd and Buck both found these assumptions to be false, and instead unearth a lack of confidence using digital tools, and in some cases a fear of technology, across study participants. Confirming these conclusions, the survey of Macaulay freshman demonstrates that while students have experience composing in online spaces previous to entering college, they struggle to apply this digital literacy practice in an academic setting.

This study builds on previous OWI (Online Writing Instruction) research by combining writing skills and digital literacies under the umbrella of composition. By asserting that successful online writing requires an understanding of rhetorical strategies, multimedia incorporation, and the use of folksonomic elements this research pushes the discussion of OWI into areas of design thinking and web development. Furthermore, the use of data-driven analytics alongside traditional methods, such as interviews and surveys, offers an intervention in OWI methodologies.

METHODS

In order to address the research questions presented in the introduction, this study required a multivariate research design. The research questions are as follows:

- How prepared are college students to compose in online, open spaces for educational purposes? How does their previous personal experience with digital technology impact their ability to develop digital literacy skills in higher education?

- What are the characteristics of student writing in online, open spaces? How does the interface/platform impact the writing students compose in that space?

- How does assignment design (i.e. the language used, the objectives, and/or the criteria) shape the resulting student work?

- How are these characteristics similar and different in writing across the disciplines? Specifically, how do they compare when the subject or content of the writing emanates from humanities/art courses and from science/technology courses?

Information about the students' previous experience writing in online spaces, student writing composed for general education courses using the ePortfolio platform, and assignment prompts provided by the instructors all needed to be collected and analyzed. Data was collected through a quasi-experimental empirical research study based on a survey of first-year students, a distant reading of student writing, and analysis of instructor provided pedagogical materials. The combination of these materials speak to a gap in the current scholarship on online writing by addressing the relationship between assignment design and the inclusion of multimedia and folksonomic elements in composition across the curriculum. The intention is to provide data-driven evidence of student-centered digital literacy practices gleaned from a long-standing and well-supported online writing program. The results demonstrate that students entering college are not "digital natives" who can successfully compose digital texts without explicit instruction and support.

The Survey**

As Kevin DePew argues in "Through the Eyes of Researchers, Rhetors, and Audiences: Triangulating Data from the Digital Writing Situation," textual analysis alone can "limit researchers to informed speculation" (2007, p. 55). Therefore, a survey was created to address the myth that students enter college with a set of digital literacy skills that instructors can reliably expect students to execute in an academic setting (see Notes). Built in Opinio – a survey platform that provides secure data collection - the electronic survey was distributed to freshman enrolled at Macaulay in a weekly newsletter distributed via email, and reminders to participate were given by the ITFs in the first year seminars. This method enabled

data to be collected from the greatest number of freshman at the earliest stage of their exposure to the Macaulay ePortfolio platform. The intention was to collect data on their experience composing in online spaces prior to entering college while ensuring that they had a basic familiarity with the terminology associated with digital writing. At the time of distribution the students had completed coursework in their first seminar using the ePortfolio platform with formal instruction from their professors and support from the Instructional Technology Fellows (ITFs).

The consent form and survey questions were composed in collaboration with the ITFs to ensure readability, and the Institutional Review Board (IRB) approved both before distribution. There were a total of eleven main survey questions, and several of these prompted follow-up questions if answered in the affirmative. Aside from the first three contextual questions, presented in a Y/N format, the substantive questions asked if the participant performed a specific act, and if so, how often (with options provided). Questions were arranged from simplest to most complex, and from general to more specific, as suggested by Empirical Research in Writing by Mary Sue MacNealy in her chapter on survey methods (1998). Also as MacNealy suggests, the questions were grouped by topic, and the format of each question was similar to all previous questions (1998).

Over 150 students participated in the survey, although not all of the participants completed all of the questions. This represents over 20% of the targeted population. As defined by The Writing Studio at Colorado State University, this not a true experiment since a strict control group is impossible, for reasons including uncontrollable variation in the respondents' demographic and educational history, as well the researcher's bias as a participant-observer. However, the Macaulay program does offer a particularly advantageous set of controlling factors that shaped this case study. Every student admitted to the honors program receives a new Macintosh laptop, full tuition, and the assistance of ITFs. Macaulay does not accept transfer students, so all of the students in the general education courses are traditionally aged and recently graduated from high school. To verify this information, the survey asked students to identify their age, the high school they attended, and what languages they speak (indicating which is their primary language). These factors ensure that all of the students are the same age, speak the same language, and have access to a personal computer, similar software, and support in using these tools.

Text Analysis

While the survey of incoming students provided a broad overview of student exposure to digital tools prior to entering the Macaulay Honors Program, the assignments produced by students in the required honors seminars augmented and refined initial impressions. Over the past decade Macaulay has maintained an archive of over 3000 course sites created through the honors seminars, which provided a rich archive of student writing to data mine for this project. Student compositions were randomly selected and were coded and analyzed through a combination of text analysis and close reading. The student writing in particular, gathered through the student ePortfolio system, represents "quantitative descriptive" data; MacNealy (1998) terms "quantitative descriptive" as data that is qualitative but can be counted. Taken individually the compositions are rich in descriptive, qualitative data, but the archive as a whole demonstrates patterns described quantitatively. By using online writing produced in the general education seminars as a source of qualitative data, this method enabled a comparison of

mode and media inclusion across the disciplines (research question number 4).

With permission from the administration and the IRB, access was granted to only those sites that are public for the purposes of this research project. The relevant information was extracted from the WordPress database for use by the researcher and organized into a new database for the purposes of this study. Without examining the context of each site, a large-scale data analysis of content from the WordPress database would not have led to insights concerning the language of the assignment, the resources provided by the ITF and instructor, and the nature of the engagement that produced the post because this information is obscured by the distant reading process. Therefore, selecting a smaller subset and separating the posts into assignment and student product enabled a deeper understanding of the rhetorical situation.

From the archive of Macaulay ePortfolios, eight sites created during the 2013-14 school year - the same year that the survey was administered – were selected for coding. The eight sites originating in writing intensive courses and contained assignment information provided by the instructor in order to determine two interrelated factors: first, whether the assignment was low or high stakes and second, as a point of comparison between the instructor's directions and the student compositions. The spreadsheet created for this project was created to sift through this data by breaking the content down by course, student, and assignment, as well as coding columns for each assignment post. These columns correspond to the research questions for this project but are designed to be reusable by any researcher interested in identifying mode and media types extracted from a born-digital archive of writing (see Notes).

The Coding Process

The coding process illuminated the structure of the course sites, the kind of events students attended, the role of the ITF and instructor, and the class's community engagement. Writing samples were extracted from a randomized selection of students and coded each sample to indicate the writing mode, multimedia usage, and folksonomic elements of digital composition. The coding schema broke down these three elements into nuanced sub-categories that further enable any researcher to replicate this process for a similar data set (see Notes). A randomly selected six out of a possible twenty-two students from each seminar were chosen as a representative sample from each course section. Then a low stakes assignment (one worth 20% or less of the course total completed early in the semester) and a high stakes assignment (worth more than 20% and part of the final project), were selected for coding.

To compare how students write across the disciplines and across different kinds of assignments, textual elements were coded as either extensive or reflexive. Once the mode of student writing was determined, the posts that contained multimodal elements were coded and then further distinguished by the type of media —video, image, audio, or infographic. The database indicates whether the students created the media themselves or imported it from an outside source. The posts were also coded for folksonomic elements: categories, tags, and comments. Evidence of both the inclusion of media and the use of folksonomic elements were intended to help determine whether students transferred the digital literacies cultivated through the use of social media into their academic work.

SURVEY RESULTS

As discussed in the literature review, Yancey's thesis is that educators can and should tap into the seeming desire to write displayed by the student's constant use of digital technologies to produce multimodal texts, and translate this writing experience into our classroom practices. In order to do that, educators need to find out where and how students are writing outside the classroom and find ways to transfer those skills into an academic context. As Smale and Regalado claim, "despite the persistence of the digital native image in the media, however, not all college students own and use these technologies to the same extent, which can hamper their ability to use ICT effectively for academic purposes" (2014).

In order to determine the preparedness of Macaulay students to use the Wordpress platform in their coursework, a survey was given to incoming students inquiring about their experience composing in online spaces prior to entering college. The data was compared to CUNY-wide and nation-wide surveys (Smale and Regalado, 2014; Lenhart, 2015; Moore et al, 2016), which found similar results: while many students have personal social media accounts, and there is an increase in exposure to digital technologies at the 9-12 grade level, most students have difficulty applying their digital literacy skills at the college level. As Moore et al. argue, "Even though the nature of texts, textuality, textual production and reception, and the writing lives of students have changed drastically, we are, as Yancey (2009) claimed, still teaching writing like we taught it 100 years ago" (2016). This research study found that many students did not feel comfortable using new tools or implementing digital

literacy practices in their coursework at Macaulay, unless explicit instruction was provided. This provides data-driven evidence that even honors students educated in urban institutions do not match the digital native myth, and therefore our institutions of higher education need to be prepared to support students in the development of these skills if they consider them essential learning outcomes.

The survey provided to Macaulay students assumes generalized Internet access for college-aged Americans based on nationwide survey data and the CUNY-wide data collected by Smale and Regalado. Therefore, the questions focus on which web-based platforms Macaulay students use to compose and for what purposes (see Notes). Questions 4 and 5 of the survey of Macaulay freshman provided a list of the most popular social media platforms to participants with the intention of capturing as many sites as possible, not just those that the students might remember and name on their own. The sites listed were selected by researching which social media sites had the most traffic and users at the time, and those search results were compared across several sources.

The survey identifies which social media sites the students had accounts for and how frequently they used the sites with the intention of understanding what kinds of sites they use most often. According to this survey of 150 Macaulay freshmen, 90% of students who participated have social media accounts, although the results of the survey also indicate the dominance of a few social media sites, despite the variety of options (see Figure 1).
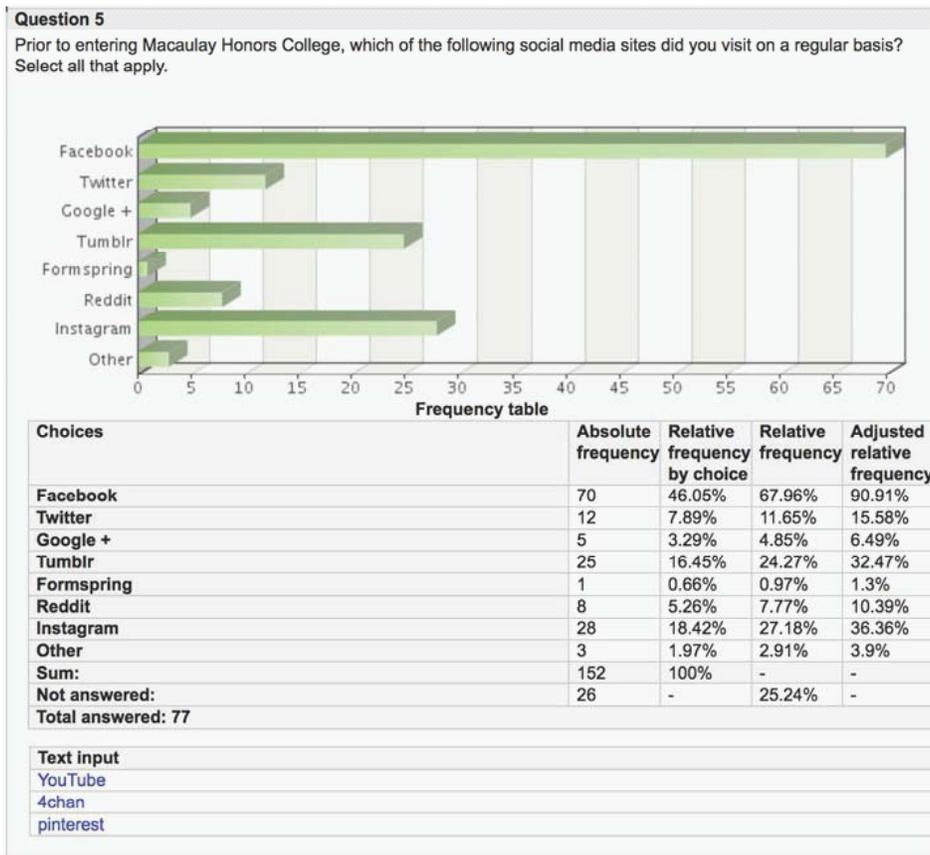

Question 5

Prior to entering Macaulay Honors College, which of the following social media sites did you visit on a regular basis? Select all that apply.

Frequency table

Choices	Absolute frequency	Relative frequency by choice	Relative frequency	Adjusted relative frequency
Facebook	70	46.05%	67.96%	90.91%
Twitter	12	7.89%	11.65%	15.58%
Google +	5	3.29%	4.85%	6.49%
Tumblr	25	16.45%	24.27%	32.47%
Formspring	1	0.66%	0.97%	1.3%
Reddit	8	5.26%	7.77%	10.39%
Instagram	28	18.42%	27.18%	36.36%
Other	3	1.97%	2.91%	3.9%
Sum:	152	100%	-	-
Not answered:	26	-	25.24%	-
Total answered: 77				

Text input

YouTube

4chan

pinterest

Figure 1: The Results of Question 4 of Survey Distributed to Macaulay Freshman.

This percentage confirms that just as nation-wide research (Moore et al., 2016; boyd, 2014) and the CUNY-specific research (Smale and Relgalado, 2014) indicates, Macaulay students write on social media sites, whether they are conscious of the implications of that practice or not. The majority of respondents in this survey indicate that they have a Facebook account; Facebook is a social media site (founded in 2004) available to anyone over the age of thirteen who agrees to the terms and conditions. A 2011 Pew Internet & American Life Project indicates 93% of social media users ages 12 to 17 have an account with the social network company Facebook (Madden et al., 2013). Results of the Macaulay survey match the Pew findings, confirming the assumptions that the majority of college students communicate in online spaces.

The results of Question 4 in the survey indicate that Instagram is the second most popular social media platform among Macaulay freshman, followed by Tumblr. Both Instagram and Tumblr are image-driven platforms. Users of these sites typically share their original photographs and videos or "re-post" images shared by another user. The use of text on both of these sites is typically minimal, but the use of folksonomic elements such as tags is very common. Therefore, it is safe to assume students have a basic understanding of how and why tags are applied to digital content.

Further, the results indicate that the technological education Macaulay offers its students in composing in online open spaces using the ePortfolio system is building off of pre-existing exposure to and experience with not only text-based composition, but also other kinds of media, including audio, visual, and folksonomic elements like tags. There is a clear need to guide students in how to transfer their digital literacy practices from their personal lives into an academic context. With respect to digital literacy, the high percentage of students who reported using social media sites also suggests that educators have an opportunity, if not a necessity, to inform students on the benefits and consequences of composing online because they may not be aware of concerns about privacy and data collection, or the way that filter bubbles and search algorithms manipulate access to information.

The use of social media sites serves as an entrance point to questions that specifically addressed the use of blogging platforms and the level of literacy students had with blogging technology. The next set of questions examined the use of digital writing spaces, specifically blogging platforms, for educational and extracurricular purposes. Moore et al. report that students seldom compose on blogs compared to other mediums—only 600 of 5714 cases reported—but when they do use blogs, it is for entertainment or personal use, not for educational use (2016). Unfortunately, only 78 students responded to this question in the Macaulay survey, but of those the survey found that 42% of respondents report that they used blogs for educational purposes prior to entering Macaulay (see Figure 2).

The data gathered from this survey indicates that less than half of incoming students are likely to be familiar with a blogging platform similar to the one they are asked to use in their four required Honors seminars at Macaulay.

Additionally, only a small number of students are familiar with using blogging platforms for personal use before entering Macaulay, and even fewer have hosted their own website. Only one respondent hosted a personal website on a private server; only one purchased
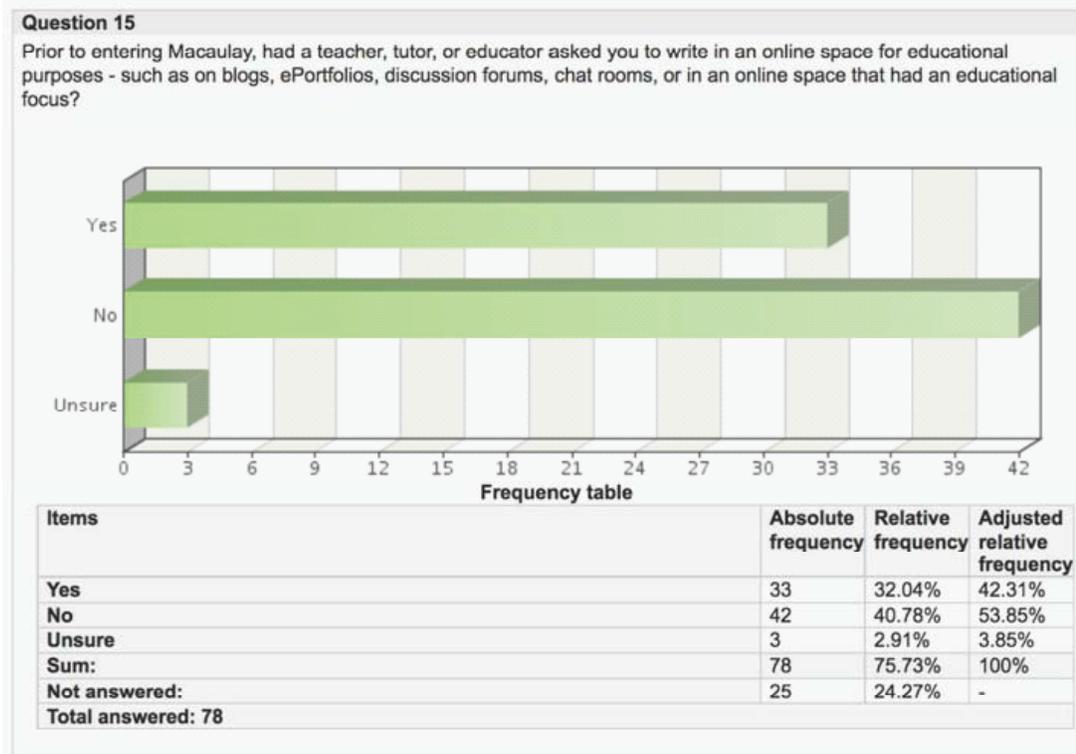

Question 15

Prior to entering Macaulay, had a teacher, tutor, or educator asked you to write in an online space for educational purposes - such as on blogs, ePortfolios, discussion forums, chat rooms, or in an online space that had an educational focus?

Items	Absolute frequency	Relative frequency	Adjusted relative frequency
Yes	33	32.04%	42.31%
No	42	40.78%	53.85%
Unsure	3	2.91%	3.85%
Sum:	78	75.73%	100%
Not answered:	25	24.27%	-
Total answered: 78			

Figure 2: Results of First Part of Question 10 of Survey Distributed to Macaulay Freshman.

a domain name; and only one wrote code using a programming language to develop the site. Of the thirteen respondents who provided additional information about their blogging use, twelve used a blogging platform, and in the comments provided the names of the following web services: Wordpress, Blogger, LiveJournal, Tumblr, and Fatcow. The first three are blogging platforms similar to the platform used by Macaulay. While only a few students report familiarity with blogging for personal or academic use, these numbers could increase be due to New York City's evolving Common Core technology requirements.

As of January 2016, the current "Common Core Standards for Writing" state that students in grades 9-12 should be able to "[u]se technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information" (CCSS.ELA-Literacy.W.11-12.6). To ensure that all New York City schools comply and assess the Common Core Standards, the Department of Education has created common curriculum maps that lay out each assessment standard with suggested assignments. This document, specifically asks students to create a digital text that includes outside research and media. The prompt reads:

> Create a blog post using information from your research paper and various multimedia components to enhance your research findings. Update or enhance the information

Table 1: A breakdown of the instructor-provided assignments by section. Each course has one low and one high stakes assignment represented.

Course	Seminar 1: Arts in NYC		Seminar 3: Science&Technology in NYC	
Section	Professor A: Baruch College	Professor B: Brooklyn College	Professor C: Macaulay campus	Professor D: Brooklyn College
Low-Stakes Assignment	"blog posts will describe, analyze, contextualize and evaluate the art, performances and readings you seek out and experience"	"blog posts from an excursion trip to the 9/11 and Vietnam Memorials in New York City"	"select peer-reviewed scientific journal articles to summarize and report on in 400-500 word posts"	"bring your perspectives about the readings to bear in the reflections [on an article, to] "improve your critical reading, thinking, research, and writing skills"
High-Stakes Assignment	"As you post on the blog and make entries in your scrapbook, look for themes, issues and stories that particularly interest you, and connections and through-lines that you see in your various posts. By the second half of the semester, you will identify a topic for a larger research project that you want to pursue in your oral presentation and final project."	"Create and post an Aesthetic Interaction as your final project."	"The end of unit assignment for Unit 2 is a group video project related to doing science in the city [...]The goal is to produce a 2-3 minute video presenting scientific concepts for a public audience. You can chose to make this the public face of your poster research project or something more general about doing science in the city. There will be time during class to work with your group and our ITF on this project. It will be graded on a four-point scale and is 20% of your final grade."	"For our final project, students unite what they've learned about informal science in the classroom with an informal science project in the city. Each group is responsible for creating a digital artifact, a co-authored paper, and a website that documents the project's process." "You can really use any digital medium and format to fulfill the objectives of the assignment."

from your research paper by linking to other supporting information and displaying the information flexibly and dynamically. Make effective use of available multimedia components, including hyperlinks, images, graphics, animation, charts, graphs, video, and audio clips. (CCSS. ELA-Literacy.W.11-12.6).

The "9-12 English and Languages Arts Curriculum Map" was recommended, but not required in the 2013-14 school year, and was required by the 2014-15 school year. Therefore, if high schools complied with this recommendation, then students who were in their first year at Macaulay in 2013-14 were more likely to have been exposed to blogging and multimodal composition in their high school course work, and future freshman would very likely be familiar with blogging before they enter college.

Despite the anticipated increase in exposure to online writing platforms in an academic context prior to entering college, this study found that explicit instruction is still needed for each assignment given at every level of education. Further analysis done by mining the student writing and instructor provided assignment prompts archived on the Macaulay ePortfolio platform revealed that students do not transfer their digital literacy practices into an academic context unless extensive support is provided.

TEXT ANALYSIS RESULTS
All Macaulay Honors College students are required to take four general education seminars: "The Arts in New York City" (Seminar 1), "The People of New York City" (Seminar 2), "Science and Technology in New York City" (Seminar 3), and "The Future of New York City "(Seminar 4). Each of these seminars utilizes the ePortfolio platform in a different way, ideally matching the technology with the official objectives of that course designed by Macaulay and implemented by the instructors. Of the four required seminars at Macaulay Honors College, two were chosen for this study to provide a comparison between student writing in humanities courses versus science courses. The first course examined is Seminar 1, which is the first course taken in the fall term of freshman year. This course represents humanistic inquiry and is intended to provide students with a foundational knowledge in art, literature, music, and theater. The second, Seminar 3, is taken in the fall of sophomore year and is grounded in scientific inquiry.

Table 1 breaks down the four courses selected for this study and the descriptions of the low and high stakes assignments provided by the instructor. The course numbers, names of the professors, and the names of the students have been removed and replaced with non-identifying letters and numbers.

Each of the posts collected from the course sites was coded as either reflexive or extensive as determined by the updated version of Janet Emig's definitions. This system of coding enables a comparison of the how students communicate in the digital space across assignments within one course, across different sections of the same course, and across the disciplines. Comparisons across different sections of the same course, in particularly, provide insight on how the site design and assignment language influences student production. Therefore, this section is organized to aide the reader in comparing the mode and media in two sections of the same seminar before moving on to the two sections from the next seminar.

This next section is divided in order to help readers draw comparisons across the disciplines. The first section will provide results and analysis regarding the writing mode and media inclusion in student compositions collected from the humanities.

The structure is as follows:

Humanities Course A

- Mode
  - o Low Stakes
  - o High Stakes
- Media
  - o Low Stakes
  - o High Stakes
- Analysis

The next section parallels this structure for the student writing collected from the sciences. Analysis resulting from comparing writing across the disciplines follows in the "Conclusions" section.

THE HUMANITIES
This section presents the findings and analysis of data collection from Seminar 1, "The Arts In New York City." Since these courses take place in New York City, Macaulay uses this opportunity to make Seminar 1 immersive, and the school has cultivated relationships with many cultural institutions that give discounted tickets or free admission to Macaulay students. It is up to each instructor to incorporate planned immersion trips and to design a syllabus with a variety of readings and research assignments that augment the cultural experiences. Since professors of English, Art History, Theater, Fine Arts, and History from eight different undergraduate institutions within CUNY teach this course, the objectives are broad guidelines meant to give instructors freedom to design their syllabi based on their expertise. However, the guidelines emphasize writing, observation, analysis and reflection. The language of the course objectives instruct students to "construct clearly written and well-reasoned analyses" and "formulate their own individual aesthetic values," which suggests that the resulting assignments would include a mix of reflexive and extensive writing as student blogs moved between reviews of cultural experiences and the analysis of specific works of art.

Student writing collected from the two representative Seminar 1 course blogs is divided into low and high stakes assignments as described in the methods sections. Data results presented below focus on evidence showing patterns in the writing mode and media inclusion in these humanities based courses. Information from the assignment sheets provided by the instructor informs this analysis.

Course A
Mode
Low Stakes Assignment. Professor A's Seminar 1 taught at Baruch College in Fall 2013 (hereby known as Course A), asked students to compose blog posts based on nine prompts that mostly emphasized cultural immersion experiences. For the first sample of student work from Professor A's Seminar 1, the first low stakes assignment selected was completed early in the semester filed under the category "Transcultural Moment." The language of the assignment states, "blog posts will describe, analyze, contextualize and evaluate the art, performances and readings you seek out and experience" ("Assignments").
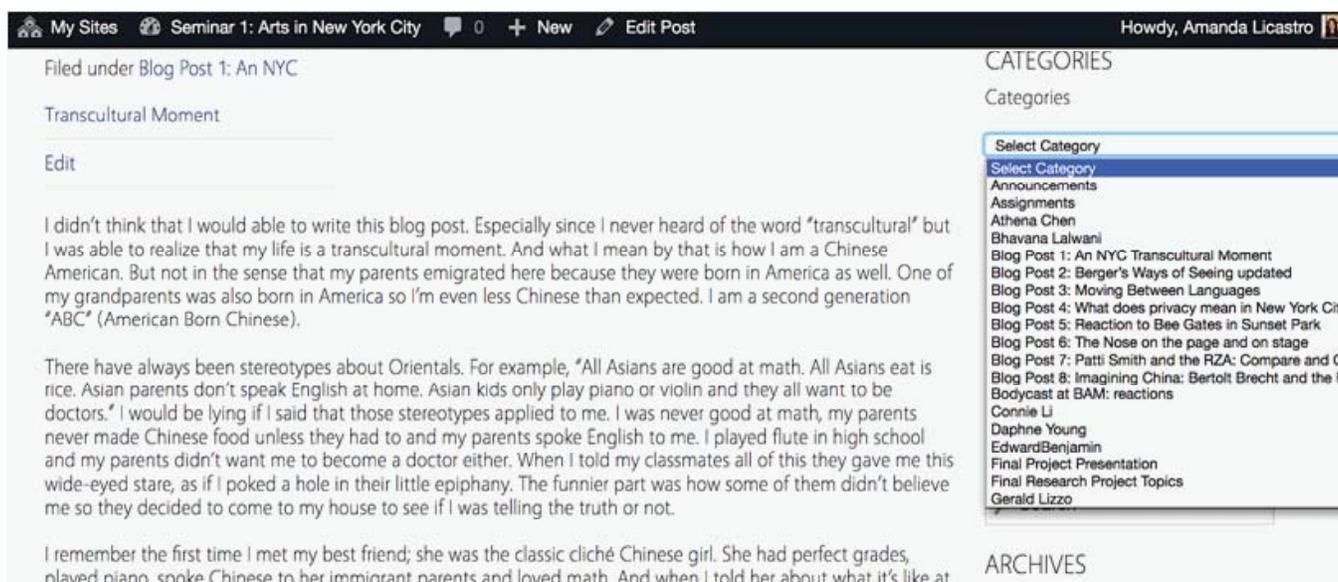
Figure 3: A Screenshot Displaying the Menu for Professor A's Seminar 1 Site.

Although the rhetoric in this assignment suggests students could write in either the reflexive—"describe" and "experience"—or the extensive—"analyze" and "evaluate"—individual prompts led students to default to the reflexive mode. All of the posts under "Transcultural Experience" used the first person singular to describe a moment in the student's personal history and reflect on that based on the class discussions and readings on the topic. All six posts coded under this assignment prompt were written in the reflexive mode. Most were very personal, describing familial relationships, cultural traditions, and emotional reactions to periods of acclimation.

For example, this excerpt demonstrates the type of reflexive writing composed in response to this assignment. NOTE: The texts extracted from the student posts included in this article are presented without alteration. Any errors are intentionally included, based on Peter Elbow's argument that student writing is just as critically valid as any academic writing and should be approached from a respectful place.

> My whole life the mixings of cultures seemed normal to me. I was raised on rice and beans and matzo ball soup. The sounds of my father's Spanish and my mother's Yiddish accent mixed together in my head like music. It was not until I got older that I began to see the how people of different cultures separate themselves from each other, and when cultures combine it is a special moment. (Student 1)

This post from Student 1 has all the hallmarks of reflexive writing. Evidence from all the posts collected from this course suggest that through this form of personal writing, students encounter diversity at a personal level that can internalize abstract concepts. Asking students to reflect on course content through personal experience in a public forum concretizes the theoretical concepts introduced by the professor or through course readings—in this case a "transcultural moment"—through a variety of perspectives. Furthermore, sharing this form of reflexive writing can help to form a community within the class by creating bonds and connections between students.

High Stakes Assignments. The high-stakes assignments for Professor A's Seminar 1 course primarily used non-textual media. The assignment prompted students to collect materials throughout the semester and then extract a research question from a pattern or theme they identified. Posts contained videos, images, and sound, but very little text. A number of the posts produced to satisfy the "Final Presentation" assignment in Professor A's course contained a brief description of the project, all of which were all written in the extensive mode. The students' posts focused on framing their projects and showcasing their conclusions. Written in a formal, academic tone, the descriptions were clearly aimed at an external audience. Many posts also incorporate research from outside sources. For example, Student 2's final presentation post integrates outside research to define terms and support analysis of the audio clips presented in the post:

> Although it may not have a distinctive quality to it, maqām Rast gives off feelings of pride, proudness, and power (Touma). The very word "Rast" is seen as being similar to the Hebrew word "Rosh" which means "head" or "beginning." It is believed that this is the reason why Rast is used whenever a new weekly Torah book is to begin that week (Blanco). (Student 2)

This post has all the hallmarks of the extensive mode: it is informative, analytical, and directed toward an external audience. Aside from presenting research, this student utilizes written text to explicate the significance and offer an interpretation of the audio clips posted for the final project. In doing so, this student demonstrates the ability to compose in a formal writing style while effectively incorporating media.

In other final presentations, students in Professor A's Seminar 1 demonstrate their use of the extensive mode orally through video or audio clips posted on the course site. Additionally, Professor A remarked on the student presentations in the comment section, which provided information about the level of research and professionalism delivered during the in-class presentation. These materials were considered when determining which posts were

extensive and which were reflexive. All of the high stakes posts in Professor A's course were written in the extensive mode except two: one that contained mostly images and another that could not be coded because of a broken video link.

As honors students, this set of freshmen may arrive at Macaulay with greater academic preparation and knowledge than the average CUNY student. Therefore, it is unsurprising that the honors students in Professor A's Seminar 1 strove to meet the more formal and analytical standards of scholarly writing by composing in the extensive mode in response to a high stakes assignment that would greatly affect their final grade. Even when an assignment is framed to be reflective and experiential, students who are enculturated into the norms of academic standards default to a more formal, impersonal tone in their compositions.

Media

Low Stakes Assignment. Neither of the low-stakes assignments in the Seminar 1 sites coded for this study contained language that specifically requested the use of multimedia, nor did the assignments utilize media in the instructions. Considering the posts coded for the "Transcultural Moment" assignment were very personal in nature, a photograph of the student, their family, their neighborhood, or their favorite food all would have been appropriate here – and would have enhanced the post. Had this been a post on social media the audience would expect an image, video, or slideshow to accompany the text. Of the 6 posts coded for Professor A's class, one student includes a self-created video, one included a self-created image, and one included an external image. The lack of media in the low stakes posts may be explained by the corresponding "Scrapbook" assignment that asked students to collect their pictures under that category. The "Scrapbook" section of the site appears to be a place for students to collect media from their journey through the seminar, but it may have discouraged the integration of media and text.

Typically in Seminar 1 courses, the ITFs and instructors collaborate to decide how the site should be organized before the course begins and then to designate what categories each assignment should fall under. Ideally, the way to use the features of WordPress in order to build intuitive information architecture is explained to students. Otherwise, it is not obvious to students that categories can be menu items and that these decisions are deliberate and have a significant impact on the user experience of a WordPress site. The design of the site influences how students organized their work. In Professor A's course, ITFs gave students instructions on how to categorize posts, which ensured that each composition was posted to the correct section of the site and created a useful drop down menu of the post categories (see Figure 3).

The drop-down menu contains all the categories used to sort the student posts by assignment, making the site easier to navigate, and showing the students how adding categories can translate into a more intuitive user experience. Even though these categories were most likely supplied by the ITF or instructor, understanding how these keywords affect the information architecture of the site is an important digital literacy skill.

Despite the presence of categories in Professor A's Seminar 1 site, none of the posts contained tags. Again, students should be familiar with the practice of tagging through the prevalence of this convention on social media. Just as categories directly affect the information architecture of the site, the use of tags would make the

posts easier to search, and it would be easier to identify recurring themes in the posts if the students would have utilized this feature of the WordPress platform. Additionally, WordPress themes often default to include comments sections, which need to be turned off manually if the creator prefers not to have a commenting space. These commenting spaces provide an opportunity for students to respond to each other asynchronously, continuing discussions outside of structured instructional time, and extend the possibility for outside readers to join the conversation as well. Both of the Seminar 1 course sites contained commenting functions on all posts, yet none of the posts included comments by the community of students or outside readers.

Arguably, commenting features constitute one of the primary goals of prompting students to write in a public, open online space: the ability to share, read, and comment on each other's work outside of class time. Interaction is a key objective in integrating the blogging platform into a digital writing curriculum. Without that interaction—and the inclusion of media and tags—the students might as well write individual papers turned into the professor alone. Like tagging and including multimedia, commenting is also a digital literacy that can be cultivated through the use of social media; the practice of commenting or responding to a post is a common occurrence across all social media platforms. Therefore, fostering the use of folksonomic elements and respectful commenting practices are digital literacies that have a clear application outside the classroom.

Course B
Mode

Low Stakes Assignment. Similar to Professor A's Seminar 1 course, all of the low-stakes posts collected and coded from the section taught by Professor B were written in the reflexive mode. For this course, posts from an excursion trip to the 9/11 and Vietnam Memorials in New York City were coded for the low stakes assignment because it was an given early in the semester as part of a collection of posts on field trips taken together as a class. Like the posts on Professor A's site, the student responses were emotionally charged and opinionated. In one post, the student connects a previous experience visiting the memorial in high school with the class trip for her Seminar 1 at Macaulay, noting the emotionally similar response:

> When I went to visit the 9/11 Memorial last year with my senior class, we were each assigned the name of a victim to research so that we could all feel more personally connected to our surroundings. One by one, we all read several short lines for each victim that will forever be the legacy of those who perished in the brutal terrorist attack a few short years ago. The memorial's vastness made me feel tiny and helpless in comparison. The rushing water drowned out my senses and all I could hear was static all around me. I remember feeling upset, confused, and overwhelmed. Contrary to what I was expecting, I felt similar emotions when we visited the Vietnam Memorial last Thursday. Having no personal connection to Vietnam whatsoever, I thought all we would be seeing were some gruesome pictures and memorabilia from the war. I thought wrong. (Student 3)

The rhetoric employed by this student is not typical of a formal, graded, academic assignment requiring the objective analyzes of a historical site. Instead, the language conveys personal observations

and initial reactions, both of which are hallmarks of the reflexive mode of writing. By focusing on a collective experience, this assignment invites students to appreciate the difference each brings to a physical and emotional encounter with history, art, and architecture, thereby satisfying one of the course objectives expressed by the Macaulay guidelines.

High Stakes Assignments. In both Seminar 1 courses, the final, high stakes assignment included an in-class presentation that was not captured on the site, which made it difficult to code the writing mode of the students' compositions. In the section of Seminar 1 taught by Professor B, all of the final projects were videos produced by more than one student in groups. After listening to each video, content was coded the as reflexive or extensive based on the discourse used by the students in the videos. In contrast to Professor A's course, all of the final projects coded for this section were presented in the reflexive mode. Students shared opinions and debated verbally in these videos. They based a large majority of their claims on personal experience, although they occasionally mentioned resources from the course content to support their opinions. The video posts did analyze the works presented, but in the superficial, surface-level manner of a novice observer, not of a well-researched expert. Because Seminar 1 is an introductory level course, in which the official course objectives emphasize how students relate to and experience art, this final project and level of discourse is appropriate.

Media

Low Stakes Assignment. The second Seminar 1 site coded for this study is similar in structure to the course taught by Professor A. In "Arts in New York City" taught by Professor B at Brooklyn College, students posted reflections on field trips taken together as a class and individually. These posts are also arranged by category, and content can be searched by content category or by author through the right side menu (see Figure 4). Again, students were provided categories by the ITF and professor, which could serve as an introduction to information architecture. While all of the posts contained categories, none of the posts included tags.

The course site contains rotating images in the header, a class picture on the "About" page, and introduction videos in the first post assignment. Therefore, the space itself encourages multimodal composition. However, this low stakes assignment did not require media through the use of specific language in the prompt, and the results demonstrate the consequences. Since the low stakes assignment centered on a cultural immersion trip to the 9/11 and Vietnam War memorial sites where students were encouraged to take pictures, the expectation was that these posts would contain media. However, only two of the posts contained student-created photographs, and none of the posts contained videos. When participating in Seminar 1 as an ITF, I attended this field trip to the memorial sites and witnessed students documenting the excursion with their phones. Considering both my experience and the knowledge that the students had just completed the "Night at the Museum" event, the lack of media is perplexing.

Figure 4: A Screenshot Displaying the Menu for Prof. B's Seminar 1 Site.

Content (Reflexive/Extensive)	Student Image	Student Video	Student Audio	Student Interactive	External Image	External Video	External Audio	External Interactive	Categories	Tags	Instructor Comments	Community Comments
Low Reflexive	Low True	Low True	Low True	Low True	Low True	Low True	Low True	Low True	Low True	Low True	Low True	Low True
12	3	1	0	0	1	0	1	0	9	0	2	0
Low Extensive	Low False	Low False	Low False	Low False	Low False	Low False	Low False	Low False	Low False	Low False	Low False	Low False
0	8	10	11	11	10	11	10	11	2	11	9	11
High Reflexive	High True	High True	High True	High True	High True	High True	High True	High True	High True	High True	High True	High True
6	8	5	7	6	10	7	7	4	11	4	6	1
High Extensive	High False	High False	High False	High False	High False	High False	High False	High False	High False	High False	High False	High False
4	2	5	3	4	0	3	3	6	0	5	5	9

Figure 5: Summary of Totals from the Coding Spreadsheet Showing How Often Students Use Multimedia and Folksonomic Elements in their Compositions

High Stakes Assignments. The requirement to use multimedia in the high stakes assignments was explicit in the language of both Seminar 1 course sites. In Professor B's section of Seminar 1, students created final projects in groups, and all of them were short videos that were posted to the course site under the category "final projects." Professor B had students build off the initial Smart History project from the "Night at the Museum" event to create videos that combined audio and visuals to highlight student conversations about an artistic object. It is worthwhile to note that these videos all contained multiple mediums, such as images, music clips, voiceovers, as well as showcasing video editing techniques. That the student-produced videos include many different types of media means the students are applying the skills learned in the common events to their coursework. Furthermore, four of these posts included tags, all of them had instructor comments, and one had a comment from a classmate. While only a minor shift, over the course of the semester the students and instructor increasingly utilized the functions of this particular platform. The final projects on both sites showcased products that fit the medium; the final projects are multimodal, interactive, and cumulative.

Analysis. Overall, 18 of the 24 posts analyzed were composed in the reflexive mode, and only 4 were coded as extensive. The question remains if this tendency toward reflexive writing is shaped by the medium or the course content. The "Arts in New York City" Seminar certainly focuses on observation and reflection, but the course objectives also highlight analysis. Both Professor A and B emphasize analysis in their syllabi and assignment descriptions, yet the results show less "well-reasoned analyses" and more personal insights based on experiential knowledge. This discrepancy could be the result of the way the medium influences the analytical nature of student composition: paper versus a Microsoft Word document versus videos. In the survey administered to Macaulay students, the majority of those who reported using a blogging site for academic purposes did so in humanities-based classes, therefore the reflexive mode demonstrated in the posts written in both Professor A and B's seminars could be due to their previous experience posting content in their high school English and History courses. However, results of the Pew Research Report "Part II: How Much, and What, Do Today's Middle and High School Students Write?" found that both students and teachers did not associate blog posts with academic writing, and therefore, despite the fact that students are informed that these posts are evaluated as part of their grade, they may not understand that online composition is a form of academic engagement. The academic discipline, whether students

are working in a humanities or science class, may also have some effect on the mode of student composition. Finally, the language of the assignment itself and the instructor's explanation of it can be one element of the calculus students use to determine whether they need to adopt a formal, academic tone—the extensive mode—or a personal, experiential tone—the reflexive mode.

Since the assignments posted to the course sites provide only minimal or no explicit instruction on the formality of these low-stakes assignments, the students may default to the kind of rhetoric they use on social media. Or the students could simply find it easier to speak from personal experience and convey an emotional reaction since more subjective writing can be more difficult to grade. However, the students participating in the honors seminars arrive at Macaulay with above average test scores and academic preparation; consequently, it seems unlikely that they are avoiding formal academic engagement by writing in the reflexive mode. My experience working as an ITF with seminar students taught me that honors students are, in fact, more comfortable with formal, impersonal writing that follows strict guidelines if they know the writing will be evaluated. Therefore, this type of personal, reflective engagement with the subject on a public forum that will be read by their classmates and their instructor is a form of risk-taking, typically reserved for private writing spaces and unshared or unevaluated pre-writing activities.

Even though the vast majority of students who participate in Seminar 1 know how to share media because of their personal social media participation and are further taught how to use multimedia in an academic setting by their ITFs, students' low stakes posts do not indicate the transfer of these digital literacies related to media; only five posts included multimedia like images, videos, or links or the use of folksonomic elements like tags and comments (see Figure 5).

Most of the low stakes posts did not contain multimedia, and very few included tags or comments; however, all of the posts included categories. The use of categories but lack of tags, media, and comments can likely be explained by examining the rhetoric of the assignment prompt as delivered orally and in writing. Elements that were required and supported through formal instruction from the professor or ITF show up in the student posts 100% of the time. Elements that were either suggested or not required are often entirely absent.

Students consistently used more media in their final projects than in their low stakes posts, but again the higher rate of use excludes tags and comments. This result could be due to a lack of time or effort put into assignments that carried less weight and were due more frequently, or due to a gap in technical competency. However, adding media does not require advanced WordPress skills and the low stakes posts do not read as deficient in effort. Many of the low stakes posts are very thoughtful and well written. Therefore, most students do not engage with the multimodal and folksonomic aspects of the platform unless specifically required to add media, tags, or comments by the instructor, even if they have the skills to do so.

In the posts composed for high stakes assignments, eight contain student images, ten contain external images, five include student videos, seven include external videos, seven integrate student audio, and seven include external audio. This marks a significant shift from the low stakes post, which confirms that the language of the assignment has a meaningful impact on student work. The posts from Professor A's class also demonstrate the use of a wide variety of media when no specific tools were required, whereas all of the high stakes assignments from Professor B's seminar contained videos.

Expectations are that high stakes assignments will be composed in the extensive mode because final research projects are characterized as being more analytical and informative. Yet, the final multimedia projects – the audio files and reflexive videos – produced in both humanities courses do meet the requirements of the course by allowing student to use close observation and conversation with their peers to formulate their own opinions. One explanation for the divergence in expectations and experience coding the final assignments produced in Professor A's course is the medium's influence on student work. It is possible that because the students, working in groups, created videos and not text, they adopted a more reflexive tone to mimic what they perceived as a more informal assignment and working environment. However, a similar assignment coded for Professor C's science-based Seminar

3 course also required students to produce group videos, which were all executed in the extensive mode. Therefore, the reflexive tone used by the students in Professor B's Seminar 1 is likely a result of the instructor's encouragement and expectations of this humanities-based course.

THE SCIENCES

The last course in the series, "Science and Technology in NYC," is intended to introduce the scientific method through place-based research. Students all attend a "Bio-Blitz" at a local park and collect data through a mobile application about the wildlife and plant species that inhabit that place. This course is taught by instructors with a wide range of specialties, from chemistry and biology to computer science and sociology, and therefore each class has a different theme and course readings. All of the students present their final research at a public presentation organized to mimic an academic conference.

The structure of this section is as follows:

Humanities Course A

- Mode
  - o Low Stakes
  - o High Stakes
- Media
  - o Low Stakes
  - o High Stakes
- Analysis

This section parallels this structure for the student writing collected from the humanities.

Figure 6: The Science Forward Times from Professor C's Seminar 3 Course Site.

Course C
Mode

Low Stakes Assignment. The first set of compositions coded for Seminar 3 were collected from Professor C's "Science Forward 2014" offered in Fall 2014 at the Macaulay campus. This robust course site included a number of web-based assignments with extensive assignment descriptions, which proved particularly helpful in the coding process. One of the low stakes assignments worth 10% of the overall grade in this course required students to select peer-reviewed scientific journal articles to summarize and report on in 400-500 word posts. The assignment did not, however, require the use of multimedia. These posts were aggregated into the "Science Forward Times," a section of the course site that was published using the online newspaper theme in WordPress (see Figure 6).

The technical effects of this newspaper were most likely achieved by the two ITFs assigned to this ambitious course, in collaboration with the professor. This particular section of this course was designed as a pilot for future Seminar 3 courses after Macaulay changed the course description in spring 2013. The coding process determined that all of the posts for this assignment were composed in the extensive mode using a journalistic style appropriate for the prompt. Here is an example in which the student summarizes the main ideas of the source article and cites appropriately:

> One of the main flavor-stimulating ingredients in many cuisines is salt, especially in fast foods. Salt makes our foods taste great and is in our daily diet. About thirty percent of the people in the United States suffer from hypertension, high blood pressure, and it is also nicknamed the most prevalent chronic disease in the world. Many of the past researches tied the string between salt and the rise of blood pressure; however, a recent study conducted by Graudal, Graudal, and Jürgens claims otherwise. The recent research shows that the amount sodium intake has no correlation to higher blood pressure in many of us and either high or low sodium diet will not affect patients with hypertension at all. (Student 4)

In this post the student reported on the content of the article critically with the intention of reaching an external audience. The academic approach, a fundamental element of extensive writing, was common throughout the low stakes posts composed in Professor C's Seminar 3. Unlike the low stakes assignments coded for Seminar 1, these posts do not use the first person perspective nor do they rely on observation or emotional reactions. Although the posts may include experiential knowledge—such as the acknowledgement of the prevalence of salt in our diets—the majority of the content summarizes the source material. This course is an outlier; most of the low stakes content coded for this study, in both the humanities and the sciences, was written in the reflexive mode, a fact that undermines the assumption that students write reflexively in short blog posts because the medium shapes their engagement with the writing space.

High Stakes Assignments. All Seminar 3 courses culminate in cross-campus conference at which students give a final presentation to an audience of their peers. In Professor C's Seminar 3 course, the final project consisted of many smaller, scaffolded projects leading up to the common event. As it was not possible to code the group presentations given orally at the common event, the final "Video Essays" served as the next best option. This assignment was the precursor to the final presentation made by the same groups on the same topic. According to the assignment sheet, "the goal is to produce a 2-3 minute video presenting scientific concepts for a public audience." Again the expected was that the videos would be composed using the extensive mode. Indeed, that expectation was met; all of the videos coded for this assignment were composed in the extensive mode in an informative and analytical tone. Although the students spoke about their own experience as researchers, the videos explicitly addressed an external audience with the intention to provide reliable information about a scientific observation. At least two of the videos included interviews with experts in the field, and all of them contained an introductory level of data analysis at minimum.

Media

Low Stakes Assignment. None of the posts coded for Professor C's Seminar 3 course contained media or folksonomic elements of any kind. As stated previously, this assignment directed student to create a newspaper, more specifically "a news essay in the style of the NY Times Science section" based on an article from a peer-reviewed journal published in the last two years ("News Essay Guidelines"). For this assignment there seems to be a fundamental disconnect between the intent and the results: newspapers contain media, yet the student work does not. While the layout and design of the student newspaper mimics that of a traditional media venue, the absence of photographs, infographics, and videos is jarring for a reader accustomed to popular online news sources such as The New York Times. In this case, neither the design nor the objectives of the assignment seemed to influence the students' use of media.

Although the language of the prompt did not specifically require the inclusion of media, the prompt does instruct students to "look at the figures presented in the results section to get an idea of the main results" when choosing an article, insinuating that most scholarly articles in scientific journals include media as well. Indeed, venues for scholarly communication in the sciences are increasingly multimodal, and if instructors intend to prepare students for a future in this field then digital publishing should be emphasized in the curriculum. Furthermore, the assignment prompt suggests that students "include quotes from scientists or other people that may be affected by the science in the journal article. You could ask me or your other science professors for commentary" ("News Essay Guidelines"). If students conducted interviews using audio or video recording, they could have included these materials in their news essays. This would also have helped the students practice the skills they needed to hone in order to complete their final video essay assignment. There were several missed opportunities to enhance student's digital literacy practices in this assignment.

High Stakes Assignments. In contrast to the low-stakes assignment, all of the students in Professor C's Seminar 3 filmed videos with their own original audio as part of their final project preparation. A video essay is a multimedia project by definition, and this assignment specifically required student-created footage and audio. Additionally, all six of the videos coded for this class included external images, and four of the six contained external audio as well. The combination of original and external media requires the students to edit their videos using advanced digital literacy. The fact that these Macaulay students were able to accomplish this editing work for this project is not surprising because they all have experience using iMovie on their Macbooks from the Tech Fair event held in the first week of freshman year.

As seen in the Seminar 1 sites, these video creation skills are also often employed in the humanities-based seminars at Macaulay. The ability to implement these skills in more than one course for a variety of purposes does show evidence of transfer, but this evidence is only consistently apparent in the high stakes assignments. Considering the evidence that students are exploring the use of multimodal elements primarily in their high stakes assignments, this indicates that both the requirements of the assignment and the time given to complete the assignment are significant factors in determining how and why students use media in their digital writing. Unfortunately, the use of folksonomic elements remains underdeveloped; the video posts for Professor C's Seminar 3 projects were all marked with the same category, but none of them included tags or comments. A tag cloud would make this site easier to search, and the comment feature could have been used to increase discussion among the students, ITFs, instructor, or members of other sections of Seminar 3 across Macaulay. Knowing that this course had two ITFs, I wonder if these options were suggested or if the ideas were discussed and willfully ignored or voted down.

Course D
Mode

Low Stakes Assignment. In this section of "Science and Technology in New York City" taught by Professor D, the low stakes assignment prompt implicitly suggests students write reflexively, hewing more closely to the standard mode of student composition in low stakes assignments. In this assignment, students were asked to "bring your perspectives about the readings to bear in the reflections" about an article provided by the instructor each week, in order to "improve your critical reading, thinking, research, and writing skills" with the "secondary goal to learn more about yourself and others as science learners" ("Welcome"). This description primarily supports the reflexive mode while still promoting elements of extensive mode simultaneously.

The coding process revealed that all six samples were written in the reflexive mode, which differs from the low stakes posts produced in Professor C's section of Seminar 3. For instance, writing in response to Professor D's prompt, the student focuses on the article they reviewed through the lens of personal experience:

> I completely agree with what the authors had to say in the article. Science should be learned through doing, not just reading and sitting in a classroom. As I child, I believed that if I crammed, memorized, and studied different scientific topics that I would truly grasp them. I learned that through that method, I would forget all the topics I learned within a few months. Exposing myself to a more practical method of learning that was more hands on allowed me to form a stronger long term memory of each topic. (Student 5)

Although this student directly engages, and quotes from, the source material just as students did while composing posts for Professor C's section of Seminar 3, this post relies on experiential knowledge over research. The posts coded for the section of Seminar 3 taught by Professor D are far more personal in nature and typical of the reflexive writing mode. This indicates that the wording of the assignment prompt impacts the results despite potential perceptions about disciplinary tradition or how much an assignment will affect the final course grade.

High Stakes Assignments. The section of Seminar 3 taught by Professor D required a final website project. Students worked in small groups to create their own websites that contained their research blogs, related media, and a final research paper. Each site is very distinct from the others: the students chose their own themes, layouts, research topics, and content. This project allowed students to display a wide range of digital literacy skills, specifically concerning the use of WordPress. In order to execute this assignment, the students needed to understand how to build a basic WordPress site, customize the site to meet their needs, and add a variety of content to the site using an organized structure. Many of these skills were developed in the mandatory final website project in every Seminar 2 course ("The People of New York City"), but the products created in response to Professor D's assignment show that students can transfer what they learned in previous courses and apply it to across academic disciplines.

The sites created for the final project in Professor D's section of Seminar 3 are difficult to code since they are highly multifaceted. Therefore, for the purposes of this study, the coding process focused on the research essay in order to determine the mode of composition. The description of this assignment on the course site states: "For our final project, students unite what they've learned about informal science in the classroom with an informal science project in the city. Each group is responsible for creating a digital artifact, a co-authored paper, and a website that documents the project's process" ("Final Project").

The key word in terms of predicting the writing mode is "informal," which would indicate the responses could be composed in the reflexive mode. However, formal research papers almost always infer extensive writing. Perhaps it is the intuition, conditioning, or training of a typical Macaulay Honors Student, but all of these co-authored research papers were composed in the extensive mode. This confirms that disciplinary expectations affect student composition style, but conflicts with evidence that the language of the assignment matters more in regards to how students formulate responses. It may be that the phrase "research paper" carries a great deal of weight in terms of connoting formal, academic writing, such that even a suggestion that the tone be informal cannot break this conditioning, especially with honors students.

Media

Low Stakes Assignment. Despite students' previous experience, none of the low stakes posts for the assignment in Professor D's Seminar 3 course contained media, tags, or comments. In fact, none of the low stakes assignment across either section of Seminar 3 coded for this research project contain any multimedia. Again, this is likely because it was neither suggested nor required in the assignment prompt. The prompt states that students should use this opportunity to "learn more about yourself and others," indicating an openness and flexibility in the expectations of the instructor and an opportunity for the students to be creative and unique. Yet, because these responses are based on readings, it is reasonable that students focused on comprehension and correctness rather that creativity.

The language of the responses coded show that students did use very personal language to describe their experience, which again presents a missed opportunity to incorporate images of their experience to enhance their work. However, all but one of the posts included categories, and several included more than one category. The use of categories makes it easier for the ITF and professor to aggregate and organize the posts by assignment. Had

the students also used tags, the audience could have searched the content by topic or area of interest. In an assignment such as the low-stakes assignment crafted by Professor D, tagging the post by the article title or author's name, or even keywords, would have enabled students to review their peers opinions on the same subject. Grouping posts together by topic also encourages commenting, a feature of WordPress that was underutilized in all of the courses coded for this study.

High Stakes Assignments. The final websites projects for Professor D's Seminar 3 course demonstrate the ability to construct a basic website and to display research in a variety of modes. The final assignment for this section of "Science and Technology in New York City" specifically required a "digital artifact." The ITF for this course posted a variety of options in terms of tools to use to create the artifact and offered to help students create these resources. All of the sites featured media of some type, but the media included was perhaps not as varied as the suggestions on the resources list provided by the ITF, which included: a documentary, a rap video, an animation, a play, a podcast, a podwalk, a cartoon, a graphic novel, or a Google Map overlay. Each of these suggestions came with examples and instructions ("Final Project Resources"). Two of the three final group projects contained student created videos and images, and one contained external videos.

None of the groups ventured to create some of the more inventive suggestions, such as a cartoon, rap video, or animation, most likely because these are not skills learned in the previous seminars. However, many of the Seminar 2 courses include lessons on making interactive maps in the form of podwalks or Google map overlays, yet none of the students in this class chose to incorporate either option for this project. This could be because making videos is perceived as easier, more familiar, or less time consuming, or it could have been a preference expressed by the instructor in class. It is also important to consider that these formats are intimidating and laborious even for advanced students and professionals in the field. Nevertheless, the uniformity in the use of media is remarkable, especially considering the sites created by these groups display variety in other ways, such as in the themes, color schemes, content layout, and other design choices.

Only one group site utilized categories and tags, and none of the sites had comments from the instructor or the community. This does not mean the projects failed to meet the requirements of the assignment or the expectations of the instructor: to accomplish the goal of conveying "everyday science" to the general public. However, in terms of maximizing the potential of the platform, these sites fall short.

Analysis. Comparing these two sections of Seminar 3, the science-based general education seminar, demonstrates that disciplinary standards have less of an influence on student writing than instructor expectation. The results show that all of the low stakes posts composed for Professor C were written in the extensive mode, while all of the low stakes posts composed for Professor D were written in the reflexive mode. Neither mode is privileged in this study, therefore these results do not indicate which assignment is inherently better pedagogically, but rather reveals what factors have the greatest impact on student writing. It is interesting to note that half of the low stakes posts in the science-based courses were to be composed in the reflexive mode, because this may signify the importance instructors place on informal, personal, exploratory writing across the disciplines. Similarly, in both sections of Seminar

3 all of the high stakes posts were composed in the extensive mode, which suggests that this type of analytical, research-driven writing is highly prized in the sciences.

While the mode of writing in somewhat consistent across courses coded for this study, the use of media is widely varied. Despite the fact that students know how to incorporate media and folksonomic elements into their posts, the singularly text-based compositions produced for the low stakes assignments for both sections of Seminar 3 coded for this study illustrate a disconnect between the digital literacy skills of the students and their willingness or ability to implement the skills unless specifically directed to do so. Therefore, if instructors want students to exercise these skills they need to make it explicitly clear that student can and should include media when appropriate to the assignment.

Even in the high stakes assignments that did specifically require original media and website design, the students did not experiment with new forms of content creation. One solution is to encourage students to experiment with multimodal composition in the low stakes assignments and then discuss the effectiveness of these attempts before embarking on the high stakes assignments. This requires a discussion of when and how to incorporate media in a way that enhances the written text, which is neither a simple task nor a skill that all instructors possess. Considering that media inclusion is relatively new in academic publications, it is reasonable to assume instructors need professional development regarding integrating and evaluating digital scholarship into their pedagogical work as well as their personal research.

PEDAGOGICAL APPLICATIONS
This section translates the results of this research into tangible, applicable suggestions. These are practices that can be implemented at any institution of higher education in any online writing program. Suggestions are meant to be applicable across any disciplinary field at any level of instruction.

- Design assignments with specific requirements for media inclusion. To foster multimedia inclusion, requirements should match the learning objectives and medium of the assignment. As this study demonstrates, students do not include media unless specifically instructed to do so in the formal assignment sheet. While media is not necessary for every assignment, when it is appropriate to use media for a rhetorical purpose, support and guidance should be provided to students in order to achieve this goal. This support could come from in-class workshops, demonstrations, web-based tutorials, and may be provided by the instructor, an educational technologist, or their peers.

- Encourage students to transfer digital literacy practices learned through personal technology use, or from use in other classes, to their online writing assignments. Give students the opportunity to demonstrate expertise with tools they are already familiar with and to teach others how to use these skills. Students also need to learn how to troubleshoot and find solutions for themselves if they need help. Sticking a balance between instructor-led and self-directed learning will depend on the student population, the level of technological fluency of the instructor, and support available from staff and administrators.

- Provide training for instructors in how and when to use the tools they wish to incorporate. One-time workshops are rarely effective when thoroughly implementing a new tool into a curriculum. Rather, close partnerships or learning communities involving faculty and staff should be formed to discuss both the pedagogical applications of the tool and the technological skills needed to implement the tool. With proper training, instructors could construct assignment sheets using media to model techniques for students (such as images, videos, GIFs, screencasts, etc.).

- Assess digital literacy as an ongoing practice. As this study demonstrates, online writing can and should involve low stakes assignments in which students can practice composing in various media. In these low stakes assignments students should be encouraged to take risks and fail without consequence. For high stakes assignments, the value placed on multimodal aspects should be weighed against the amount of time and level of support that was given to the students in order to create these materials.

- Contextualize digital literacy practices fostered in the classroom in applications outside the parameters of the assignment. For example, the inclusion of tags and/or categories in WordPress posts translates to using hashtags in social media, or keywords in databases, or search terms on search engines. Practicing and discussing how these elements function gives students a deeper understanding of information architecture across platforms. Similarly, the comments section on social media and news sites are often contested and volatile spaces abused by participants, and teaching students how to comment productively through course work could lead to more thoughtful, constructive participation online. In order to increase the use of folksonomic elements and commenting, instructors and educational technologists can model this practice by commenting on posts, and then require students to comment on a set number of posts as well.

- Include students in the process of designing online spaces. Basic instruction on web design and information architecture forms the foundation for advanced technological fluency. Furthermore, this shifts the position of the student from consumer to creator. Research shows that agency over and control within an online space supports responsible digital citizenship. For more research on digital citizenship see the work of Amy Wan.

- Adopt open access and open source platforms that allow the students to engage with the space at the level of coding. When students are able to see and manipulate the code that runs the site, they can use this space as a "sandbox" for developing programming skills. Learning the language of the web, and forming an understanding of how the web functions, is an essential digital literacy in the 21st century. Additionally, using open access tools ensures students will not be priced out of these platforms after graduation. For a more nuanced explanation see the work of Karl Stolley and Jim Groom.

Instructors need support from administrators in order to successfully design courses that encourage students to develop a digital literacy practice. New platforms and tools need to be purchased after pedagogical goals are established and discussed amongst instructors, educational technologists, and administrators. For examples on how to select the best tools fro your institution, see Issue 10 of the Journal of Interactive Technology and Pedagogy on ePortfolios. A good rule to follow is always opt for a flexible, open platform to allow for unanticipated iterations and future applications.

CONCLUSIONS

The evidence suggests instructors need to scaffold digital literacy practices into assignments with careful attention to the rhetoric they use and intentional instruction in matching purpose and method. Quantitatively, the humanities sites contained more reflexive writing: 18 of the 24 posts coded for the humanities-based Seminar 1 sites were composed in the reflexive mode, compared to 6 of 24 in the science-based Seminar 3 sites. This conveys a disciplinary divide, especially in regard to high stakes assignments.

As expected, the "Arts in New York City" seminars produced experiential, personal writing about the immersion experiences featured in this course, yet, contrary to expectation, this reflexive tone continued from the low stakes posts through the high stakes projects. In the science-based courses, all of the students composed in the extensive mode for their high stakes assignments. The persistent use of the reflexive tone throughout Seminar 1 indicates that students feel comfortable writing in an informal, personal style in their humanities-based classes, but do not feel this is appropriate in their science-based courses. Even in cases where the instructor encourages informal writing in the science-based seminars, the students produced extensive writing. The unanswered question is where the impetus for formal writing comes from for students composing for science courses.

The subset of data collected from the Macaulay ePortfolio archive provides evidence of the shift as compositions produced in science classes combine the reflexive mode of writing with the data driven methods introduced at the level of general education. This may be a fundamental difference between the two academic disciplines and the expectations of practitioners in these fields: generally speaking, the humanities value personal experience and opinion-based arguments, whereas the sciences value data. However, this distinction is shifting both with the rise of the digital humanities, which introduces a focus on data to the humanities, and with the increased emphasis on writing across the curriculum, which encourages instructors to incorporate more low stakes assignments into science-based courses. Both of these changes affect how instructors teach and design writing assignments across the disciplines. With data collected from more sites coded in this same manner, this difference could provide evidence that writing expectations vary greatly across the disciplines, or if this study was replicated over several years, it could indicate if the trend is shifting toward the inclusion of reflexive writing in the sciences, or extensive writing in the humanities.

Also, further questioning through surveys or interviews with the students could determine if these tendencies have been conditioned in students over time. From these preliminary results it appears that the tendency toward extensive writing is the result of conditioning, especially for this population of honors students who have displayed the ability to follow directions and earn high academic marks in order to be admitted to Macaulay, an elite program. The transition to the digital space does not break that conditioning: for example, the multimedia projects produced in the humanities seminars were opinion-based and argumentative, whereas the science-based videos were informative and data-driven. Therefore, if instructors wish to support informal, reflexive writing in the sciences, such a

desire must be explicit in the written and verbal instructions and should be practiced throughout the course.

The same is true for the inclusion of multimedia and folksonomic elements in digital writing: if digital literacy skills are emphasized as an objective of a program, then these elements must be explicitly required and practiced across the curriculum. The results of this study show that students are more likely to incorporate multimedia in humanities-based classes than in science-based courses. The "Arts in New York City" course produced more media-rich posts than the "Science and Technology in New York City" courses, presumably due to the emphasis on cultural immersion experiences. Yet, even with a course designed to encourage students to grapple with media, the majority of students only included multimodal elements in their posts when explicitly directed to do so. This remains true in science classes that include field-based learning where students were encouraged to take photographs and videos. Students did not include these multimodal elements in posts to the course site unless explicitly asked to do so by the instructor. In both humanities and science courses, the use of multimedia increases when instructors make it a requirement for high stakes assignments. This is logically due to the students' desire to receive a high grade by meeting the expectations set forth by the instructor in the assignment prompt.

It is not clear from this study if students possess an understanding of how folksonomic elements work or if they have the ability to implement categories and tags correctly. This is an area of the Macaulay curriculum that could be strengthened across all courses. Although categories are used to organize information on a few of the course sites, it is only carried through to one of the student sites, which indicates that this was a technical consideration implemented by the ITF and instructor and executed by the students as requested. The minimal use of categories to organize student sites does not provide evidence that the students understand why they are using categories or if they could implement this feature without the guidance of an expert. The same is true with the use of commenting and tagging: if the ITFs are suggesting the use of tags or comments, the students are not executing these suggestions. In cases where the instructor utilizes the commenting feature to respond to student writing, the students do not follow this model and add to the conversation. Commenting is such a vital part of the digital communication economy and one that students are familiar with before participating in the honors seminars because of the widespread use of social media. Developing the skill in an academic environment is a missed opportunity to cultivate active digital citizens.

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NOTES

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** For more information, such as the full list of survey questions, the consent forms, and the coding database, please contact the author at Amanda Licastro at alicastro@stevenson.edu.