Assessing Students' Information Literacy: Attitudes and Perceptions of College Students Across Generations

Heather A. Dalal, Arthur Taylor, and Sharon Whitfield

Generation Z has come of age in a world inundated with an immediate and constant flow of information from a variety of sources. This information is usually uncurated, unverified, and presented in ways that make it difficult to discern the source and the veracity of the information. While previous generations had access to similar information, it was more likely to be curated (e.g., library sources), or compiled by professionals (e.g., professional journal reporting, academics), and was also not immediately available.

This exploratory study used data collected from two surveys conducted six years apart in 2014 and 2020, sampling Millennials and Generation Z. Data were analyzed with descriptive and inferential statistics across dimensions of generation, gender, and college grade point average in relation to standards of information literacy. Findings reported include statistically significant differences in the generational attitudes and perceptions of information literacy, as well as correlations between gender and grade point average and the students' attitudes and perceptions of information literacy.

Introduction

According to Dimock,[1] president of the Pew Research Center, the Millennial generation includes any individual born between 1981 and 1996 and Generation Z includes any individual born from 1997 to 2012. Although defining generational cutoff points is not an exact science and is debated in the literature,[2] we use Dimock's definition of Millennial and Generation Z from a Western world perspective for the purposes of this study. A notable difference between the generations, according to Dimock, is that social media, the ubiquity of high-speed internet and smartphones, and constant connectivity were always available for Generation Z, while Millennials came of age at the same time these technological changes were occurring.[3]

As the Millennial generation completes their undergraduate education, higher education instruction for Generation Z moves to the foreground. Although the Millennial generation and Generation Z students have many similarities, such as being raised in an age of media saturation and convenient access to digital technologies,[4] Generation Z has even broader access to

* *Heather A. Dalal is Instruction & Emerging Technologies Librarian at Rider University, email: hdalal@rider.edu; Arthur Taylor is Professor, Information Systems at Rider University, email: ataylor@rider.edu; Sharon Whitfield is Electronic Resources & User Access Librarian at Rider University, email: swhitfield@rider.edu.*

technologies and information.[5] Generation Z students have been raised with the Amazon business model[6] and the culture of "get-it-when-you want-it" leading to an expectation that they can find information quickly and with little effort. Therefore, their information search tool is usually an online search engine and they rarely use search tools beyond that.[7] Over two-thirds of K-12 educators believe the "get-it-when-you-want-it" culture has made it more difficult for students to critically assess whether information is accurate, valid, and reliable.[8] Generation Z students have also grown accustomed to quickly skimming through top search results and only selecting the most obvious references.[9] This research suggests that Generation Z enters higher education with limited information literacy skills.

In the past, the American Library Association defined information literacy as a "set of abilities requiring individuals to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information."[10] More recently, the Association of College and Research Libraries defines information literacy as "encompassing the reflective discovery of information" indicating that information literacy encompasses an information search.[11] The American Library Association information literacy competency standards for higher education indicate that information literate students should: 1. know what information they need; 2. be able to access that information efficiently and effectively; 3. be able to evaluate the information critically; 4. be able to use the information they gathered; and 5. be able to accomplish all of these tasks in a manner that is ethical/legal.[12]

Although several studies have shown that contemporary teenagers have insufficient skills to critically assess the quality of their information sources,[13] examination of other dimensions of the information search process—such as generation, gender, and grade point average—is limited. A greater understanding of the variables which influence the information literacy attitudes and perceptions of students would both help librarians and educators teach these students to become more information literate and fill the current gap in the information literacy scholarship.

The study presented here examined the results of two Institutional Review Board (IRB) approved surveys of student attitudes and perceptions of information literacy at the same four-year institution, Rider University. The first survey was conducted in 2014, and the second in January of 2020, prior to the COVID-19 pandemic. Both surveys collected data on the students' information literacy search behavior, focusing on their attitudes and perceptions of information literacy. Statistical analysis of the data examined relationships and possible influences on students' attitudes and perceptions of information literacy. This information seeking behavior is directly related to the aforementioned information literacy standards.

Literature Review

Generation Z Characteristics

While higher education has been focused on Millennials, scholars have started to notice the next generation, referring to them as iGen, NextGen, MeGen, with Gen Z or Generation Z as the prevailing name.[14] Millennials are the most researched generation,[15] but now higher education needs to pay attention to the new generation. Scholars have noted that the change in this generation's behaviors, values, and attitudes is dramatic enough to warrant attention.[16] Differences between generations affect both how college students learn and how they evaluate information.

Research has indicated that the parents of Generation Z in the West, typically Gen X-er's (born 1965-1980),[17] were raised with a high degree of independence and are generally more

educated than their parents.[18] As children, Generation X had less parental micromanaging than Millennials did and, in turn, Generation X parents encouraged their own Generation Z children to be independent.[19] Generation Z is "more racially and ethnically diverse"[20] than previous generations. Some research suggests that Generation Z is more tolerant of opposing viewpoints and that they value safe spaces over free speech that would offend and, consequently, they avoid challenging viewpoints that oppose their own.[21] Swanzen indicates that Generation Z wants to *make* stuff while Millennials *share* stuff;[22] Generation Z is future-focused rather than being now-focused, as Millennials are; Generation Z is pragmatic, cautious, judiciously shares personal information, and are active volunteers, as opposed to being *slacktivists*, a term describing the limited impact of posting a message on social media.[23]

Those living in this dynamic technological era can take advantage of instantaneous answers to all questions whenever and wherever. Generation Z students see this as the norm because they have grown up relying on tools such as Google to complete their research. Seemiller and Grace describe Generation Z as problem solvers who can easily take advantage of all the resources and tools available to them,[24] making them more efficient. Generation Z has a strong work ethic and hope for their future.[25]

Evaluative Behaviors of Students

Evaluative criteria (e.g., reliability, validity, accuracy, authority, timeliness, and point of view or bias) are listed among the performance outcomes in the *Association of College and Research Libraries (ACRL) Information Literacy Standards for Higher Education* (ACRL Standards),[26] a document that ACRL sunsetted when the organization published the ACRL *Framework for Information Literacy for Higher Education* (ACRL Framework). The ACRL Framework is meant to keep information literacy current with the ever-changing information landscape, acknowledging students' roles in the creation of information and educating the new generation.[27] Most importantly, the ACRL Framework guides librarians and educators in teaching information literacy not by standards, but with a theoretical perspective. While the critical examination of sources can be found in most of the frames of the ACRL Framework (e.g., Information Creation as a Process, Information has Value), the most applicable frame for evaluating sources is "Authority is Constructed & Contextual.[28] This frame explores how sources can be authoritative, credible, and appropriate for information needs and calls for librarians to model critical examination. Librarians have found the checklist included in the ACRL Framework to be useful in educating Generation Z students.[29]

How Millennials Evaluate Information

The Millennial generation,[30] has had a similar experience to Generation Z, as they have been using the internet for most of their lives and expect instant access to information. Research has found Millennials' information research process to be problematic because they have a non-critical view of the information on the internet.[31] Studies have also shown a tendency for Millennial students to overestimate their information evaluation skills.[32]

In a study by Gross and Latham, Millennial students claimed finding information was easy and did not require any special skills.[33] A study by Walraven et al. found that instructing students on evaluating sources improved how they evaluated information, but that the instruction had no effect on how the students evaluated search engine results.[34] Other studies have also noted that students place their trust in search engine algorithms to provide credible

results.[35] Studies indicate students have a lack of concern about evaluating their sources.[36] Students will make source selections based on the information's relevance only,[37] or on how professional a website looks.[38] Students claim to evaluate their sources more than they do in reality.[39] Head and Eisenberg noted that students report they evaluate using a number of criteria, with currency being the criteria most often used.[40] Students also evaluate web content more than they evaluate library materials and often discuss sources with a friend, family member, or instructor. Taylor and Dalal found that students are not always familiar with the words librarians use to teach evaluation, words such as currency, relevance, authority, accuracy, and purpose.[41] These words reference core concepts of the CRAAP test,[42] the sunsetted *Information Literacy Standards for Higher Education,*[43] and the *Framework for Information Literacy for Higher Education*.[44] Research has also shown that students can describe evaluative criteria, but do not apply them when they research.[45]

How Generation Z Evaluates Information

The student authors of *An Insider's Guide to Generation Z and Higher Education* wrote: "Gen Z knows the internet. More than you." which is a clear example of Gen Z's overconfidence in their own ability to use the internet.[46] Generation Z believes analyzing information will be required in their future career.[47] However, the scholarly literature addressing Generation Z's information search process, specifically their evaluative skills, finds their information literacy to be lacking. In the "First Year Experience Survey: Information Literacy in Higher Education" study, librarians named students' inability to evaluate sources as their top challenge.[48] Nygren and Guath reported that over 68 percent of Generation Z high school students rated their fact-checking ability as good, yet 88 percent could not distinguish between stories and advertisements in a newspaper.[49] Other studies found that Gen Z students mostly consider looks and form, such as the professional layout or easy navigation of the site, when evaluating the credibility of a website.[50] Participants in a focus group by Salubi et al. indicated that students prefer their information to be useful instead of authoritative or credible; one participant indicated they did not know how to check the author's expertise.[51]

Compared to Millennials, Gen Z experiences an even greater abundance of information, gets much more information from social media, and is overexposed to fake news. The following literature largely includes studies of Generation Z students in higher education, with a few noted exceptions of studies focused on high school students. Bonnet and Rosenbaum explain that fake news and post-truth are not new, but there is a "recent surge in the use of (these) terms."[52] The literature reports that, even though Gen Z students have grown up exposed to more media, they are still easily fooled by hoaxes and fake news.[53] Participants in a study by Leeder could not self-assess their ability to identify a fake news story.[54] A study by McGeough and Rudick found that even though students considered many results, they still believed dubious sources to be credible, and many relied on simple questions to make their decision.[55] One study noted that the more Generation Z high school students used social media, the less likely they were to evaluate sources correctly.[56] Johnson found that Generation Z high school students often do not recognize bias (especially political) nor do they check for accuracy or authority of social media posts.[57] In a survey by Chen et al. over 67 percent of student respondents shared misinformation, and over 84 percent reported they might share misinformation in the future.[58]

Even if members of Generation Z do try to corroborate information, the task is much more difficult in the age of iterative journalism than it was in the "homogeneous news world

of the past."[59] Generation Z believes that more information is better, but they have difficulty and experience anxiety sifting through it.[60] Generation Z recognizes that information no longer needs to be obtained from formal sources, yet they frequently access dubious sources which makes evaluating sources correctly an even more important skill.[61] Generation Z also overrelies on search engines and has learned to trust them to provide credible results.[62] This becomes even more problematic when they search for information using their phones or their voice assistant (i.e., Alexa, Google, Siri) . This method often gives only a single result[63] or uses artificial intelligence tools, such as ChatGPT, which may have flawed training or provide incomplete and/or biased responses.[64]

The Role of Gender in Evaluating Information

Research shows differences between males and females in their attitudes and perceptions of information literacy. Studies report that females use library databases more and males use non-traditional sources, such as blogs and Wikipedia, with greater frequency.[65] Research also shows that females use academic sites more than males, who tend to look at entertainment sites.[66] Kim et al. found no difference between males and females in their use of social networking sites, but the study did find that males use social media platforms more frequently.[67] Chen et al. found that female students admit to sharing misinformation on social networking sites more than males.[68]

Studies show that males have more confidence in their search skills even though there is little actual difference in their abilities to search and use information.[69] Research indicates that males have both more confidence in searching and satisfaction with their results, whereas females experience more uneasiness and anxiety while researching.[70] The literature also finds that females are more risk-averse and appear to take a safer approach to research than do males.[71] Neely found that females rated the evaluation of sources as more important than males.[72] Nygren and Guath measured students' fact checking performance and found that the female participants were better at corroborating information.[73]

Grade Point Average and Library Usage

Research has shown both that use of the library is linked to student success, and that a student's grade point average (GPA) is a predictor of success in higher education. Studies show that students who use the library more tend to have a higher GPA[74] and that students who have had library instruction from a librarian have a higher GPA.[75] Bowles-Terry analyzed 4,489 academic transcripts of graduating students and found a positive correlation between students who had library instruction post-first-year and a higher GPA.[76] Similarly, Han and Cmor evaluated over 8000 student transcripts and found those who had multiple library instruction workshops had a higher GPA.[77] Gaha et al. normalized GPAs across disciplines and found higher GPAs for those students who had a library instruction session.[78] Rowe et al. had undergraduate students swipe their student ID cards to track attendance to distinguish between those students who actually attended the library instruction session and those who were either absent that day or whose instructor did not have library instruction. The study found that students who attended the library session had a 0.27 higher GPA (2.83 vs. 2.68).[79]

There is also a positive correlation between those who use the library's resources and a higher GPA.[80] Cherry et al. analyzed EZProxy transcripts and found students with higher GPAs are more likely to log in to library resources than those with lower GPAs.[81] LeMaistre et

al. found that students with a higher GPA were more likely to use the library resources, also by analyzing their EZProxy transcripts.[82] Scoulas and De Groote, in 2019 and 2021, found that a higher GPA is associated with a greater use of library resources; however, students with higher GPA had fewer in-person library visits and less library satisfaction.[83] In general, providing any instruction or intervention improves a student's ability to evaluate information.[84]

Method

As stated previously, information literacy encompasses the information search process. The purpose of this exploratory quantitative study is to examine characteristics of the information literacy skills and knowledge of students by examining various dimensions of their information literacy attitudes and perceptions. This study examines the generational differences, specifically Generation Z higher education students compared to Millennial generation higher education students, in addition to other characteristics as identified in the following research questions:

- What are the changes in students' attitudes and perceptions over time regarding information literacy?
- How do the information seeking behaviors of Generation Z differ from those of the Millennial generation?
- How do students' attitudes and perceptions about information relate to their GPA?

This study uses data from two Institutional Review Board (IRB) approved surveys, one conducted in 2014 and one conducted in 2020. Both surveys asked subjects to report various characteristics of their information seeking behavior with a focus on their attitudes and perceptions of information literacy, and both were pre-tested prior to data collection. The 2014 survey identified information seeking behaviors using the 2000 *Association of College and Research Libraries Information Literacy Competency Standards for Higher Education*.[85] The second survey, conducted in 2020, follows the same research track as the 2014 survey. Changes involved only minor modifications to the 2014 survey to provide additional clarity in the responses to several questions and to add text responses for some questions. Questions added in the 2020 survey were: "Do you believe evaluating information will be important aspect for decision making in your future career?" and "If possible, would you be interested in learning more about improving your information seeking skills?" The 2014 survey was based on the 2000 ACRL Information Literacy Standards. These standards have been broadened and restructured into a framework in the 2020 ACRL Information Literacy Framework, but the core concepts of information literacy, and the logically related attitudes and perceptions of information literacy, remain. Survey questions were based primarily on Standard 3 of the 2000 ACRL Standards which addresses how an information-literate student performs critical evaluation of information sources. Survey questions asking subjects about their use of information sources and the evaluation criteria used to choose information sources were developed (see Appendix A for a full listing of the questions and related responses used in this study).While the ACRL Standards—and the research which inform those standards—provide some face validity for the surveys, additional confirmation of face validity was developed by reviewing the set of questions with credentialed library faculty. Questions were refined based on library faculty input. A pilot survey was conducted for the 2014 survey and the results were evaluated. Where appropriate, questions were examined for internal consistency and further refined. Based on feedback from the faculty experts and the results of a pilot survey, the questions were further refined to produce the final 2014 survey instrument.

The final version of the 2014 survey consisted of twenty-seven multiple choice questions. The final version of the 2020 survey consisted of twenty multiple choice and five short answer questions. This exploratory study reports an analysis of a discrete subset of those questions from each survey. The subset of questions was chosen based on the focus of the study (i.e., variables which may influence information literacy) and the results of the preliminary analysis as detailed in the analysis section below. Results of each survey were analyzed discretely; the data were not combined.

Data Collection, Participants, and Setting

The survey was administered in an online environment using the university's instance of Qualtrics software. Responses were stored anonymously within the Qualtrics software and in compliance with the Rider University's Institutional Research Board standards where the data were collected. All responses were anonymous and contained no identifiable information.

To identify differences in information literacy attitudes and perceptions of Generation Z and Millennials, a convenience-style, volunteer sampling approach was used both in 2014 and in 2020. The sample of students was from Rider University, a private university in the State of New Jersey which, in 2020, had approximately 3,900 undergraduates comprised of approximately 38 percent minority students and 59 percent female students. Both surveys sampled the university population with only minor variations in size and demographics between 2014 and 2020.

An invitation to participate was sent via email to all students and a follow-up email was sent two weeks later to ensure a 15 percent sufficient response rate. While all university students were invited to participate, only the responses of students that comprise Generation Z (born between 1997-2012) were considered for analysis in the 2020 study.

Analysis

Data from both surveys was collected and cleaned, and incomplete surveys were eliminated. In the 2014 survey, a total of 386 responses were available for analysis after cleaning. In the 2020 survey, a total of 248 responses were available for analysis. Raw data from the two surveys, 2014 and 2020, were used in this study. Data were harmonized and where possible, comparisons in 2020 and 2014 surveys were made during analysis.

Specifically, questions relating to accuracy, authority, and selection of the number of sources were examined. The questions and respective answers were correlated to gender as well as grade point average to determine how these variables might influence students' information literacy attitudes and perceptions. The results were examined in relation to the 2014 survey to provide generational comparisons.

Analysis included descriptive statistics, using in-group percentages to mitigate the impact of sample bias, and inferential statistics which were appropriate for the nominal selection items used in the survey. Descriptive statistics are reported for all questions selected for this study and, if the correlation analysis results were statistically significant, they are also reported. Survey questions used nominal values of either mutually exclusive options or multi-select options. Because it is amenable to nominal value selections, the chi-square analysis of variance was used to examine any correlation between variables of subject characteristics (dimensions) and specific survey responses. This result is reported where the test demonstrated a statistically significant correlation at the .001 level ($p < .001$).

Limitations

The study reported here provides a limited set of information literacy attitudes and perceptions factors as identified by prior research conducted in 2014. The statistical analysis on these variables does not preclude the influence of other variables which were not identified in the specific contingency tables reported here.

The responses for this study were self-reported with the assumption that the subjects answered truthfully. The subjects for this study were recruited online and responded to the survey online. This limits responses to those familiar with technology. Since the survey questions concern the use of technology, and the study examines the inter-generational use of technology, this limitation is a logical requirement of the study (i.e., that subjects have some degree of proficiency in the use of technology, specifically internet search engines and library databases). This study did not capture information literacy instruction changes reflective of the ACRL Framework.

This research study was conducted at a private university located in the state of New Jersey in the United States. The surveys were deployed six years apart and participants may have been on the fringe of the defined generational groups.[86] Given the size of the sample (248 respondents), the results are generalizable to a limited degree to the full student body at the university; however, they are not generalizable to the population of college students in the United States. Additionally, international students were not sampled, and English as a second language results were not analyzed, so the results reported here are not generalizable to international populations although, as reported, some results are consistent with other studies in different populations. Finally, the 2020 survey had fewer participants.

Results

Generational Comparisons of Reported Information Literacy Attitudes and Perceptions

Analysis of generational comparisons used results from specific questions on the 2014 and 2020 surveys of Millennials and Generation Z students respectively. The specific questions analyzed are detailed in Table 1. Unless indicated otherwise, the options listed were mutually exclusive choices.

TABLE 1
Questions Used in Generational Comparisons

Question	Response
It is usually possible to determine whether the site is authoritative.	TRUE, FALSE, do not understand
How do you evaluate the purpose or bias of a web site?	multi-select from nominal set of choices
How would you know when you have enough sources for a paper?	multi-select from nominal set of choices

In 2014, 53 percent of the Millennial participants responded that they were able to determine whether a website was authoritative versus 61 percent for those who participated in the survey in 2020, an increase of 8 percent with the Generation Z subjects from the 2020 survey (see Table 2). However, the increase in the percentage of respondents who did not understand

TABLE 2 Question: It is usually possible to determine whether the site is authoritative			
Response	**2014**	**2020**	**Difference**
TRUE	53%	61%	8%
FALSE	24%	6%	-18%
I do not understand what is meant by authoritative	23%	33%	10%

the term "authoritative" indicates that a third of the students in the 2020 survey sample did not understand the term, which is a statistically significant increase from the 23 percent of respondents who indicated they did not understand the term in the 2014 survey sample ($X2 = 33.04$, $df = 2$, $p < .001$).

When asked about examining the bias of a site, statistically significant differences were identified based on generation ($X2 = 62.461$, $df = 6$, $p < .001$). As detailed in Table 3, a higher number of the 2020 sample of Generation Z students selected statements indicating they were evaluating the purported characteristics of a website. Conversely, these results indicate a slight decrease in the Gen Z selection of the response "I do not evaluate the purpose of a site."

TABLE 3 Question: How do you evaluate the purpose or bias of a website?			
Response	**2014**	**2020**	**Difference**
I do not understand what is meant by purpose in this question.	3%	2%	-1%
I determine whether or not the author of the page or the owner of the URL is trying to sell something.	24%	26%	2%
I examine whether or not the purpose of the site is to promote a particular opinion or point of view.	34%	36%	2%
I examine whether or not the site is a spam, hoax or joke.	26%	29%	3%
I do not evaluate the purpose of a site.	5%	1%	-4%
I do not believe it is possible to determine the purpose of a page returned by a search engine.	1%	0.2%	-0.8%
I check with someone with knowledge of the site or topic, for example, library staff or a professor.	6%	5%	-1%

In response to the question "How would you know when you have enough sources for a paper," responses provided a statistically significant difference, as detailed in Table 4 ($X2 = 8.64$, $df = 2$, $p = 0.01$). Results in this sample indicate that the 2020 Generation Z subjects self-report as identifying more quality sources to support a research effort than their Millennial counterparts in the 2014 survey.

TABLE 4 Question: How would you know when you have enough sources for a paper			
Response	**2014**	**2020**	**Difference**
Specific number (5,10,15) sources is enough for any paper.	15%	8%	-7%
I don't worry about the number of sources for a paper.	8%	4%	-3%
I try to find enough quality sources to support the information in my paper.	77%	88%	11%

Generation Z Reported Information Literacy Attitudes and Perceptions

Data collected from Generation Z subjects in the 2020 survey was analyzed across the dimensions of gender and grade point average (GPA). Descriptive statistics were generated using in-group percentages, the percentage of respondents who answered a question within the category being reported. Inferential statistical tests were applied to the question responses within a category; in addition, when a set of responses generated a statistically significant result ($p < .001$), that statistic is reported. Unless indicated otherwise, the options listed were mutually exclusive choices.

Gender Influence on Search Skill Confidence

In the 2020 survey of Generation Z students, when asked to self-report their search skills, males sampled were more likely to express confidence in their ability to find information online, with 41 percent of male reporting their search skills as "highly skilled" compared to 34 percents of females.

Females were more likely to feel their search skills were not strong, with 11 percent reporting they were "somewhat skilled" in finding information online versus 7 percent of males (see Table 5).

TABLE 5
Question: How skilled are you in finding information on the Web?

Response	Male	Female	Difference
Highly skilled	41%	34%	-7%
Moderately skilled	52%	55%	3%
Somewhat skilled	7%	11%	4%

Conversely, females in the 2020 sample indicated greater confidence in their use of library databases, with 17 percent reporting they were "highly skilled" versus 9 percent of males for that question (see Table 6).

TABLE 6
Question: How skilled are you at finding resources using the library's databases, OneSearch, or catalog?

Response	Male	Female	Difference
Highly skilled	9%	17%	8%
Moderately skilled	38%	43%	5%
Not skilled	13%	7%	-6%
Somewhat skilled	40%	33%	-7%

Results from the two questions combined reflect confidence in search based on gender. The results for correlation by gender are statistically significant ($X2 = 57.346$, $df = 5$, $p < .001$).

Grade Point Average Influence on the Information Search Process

The self-reported grade point average scores in our sample were biased towards higher grade point averages. To provide more meaningful groups the data were re-coded into groupings

TABLE 7
Question: How would you know when you have enough sources for a paper?

GPA	Response	Percent
Above 3.5	I meet the minimum that is needed for the assignment.	23%
	5 sources is enough for any paper	6%
	I try to find enough quality sources to support the information in my paper.	71%
Below 3.5	I meet the minimum that is needed for the assignment.	50%
	5 sources is enough for any paper	4%
	I try to find enough quality sources to support the information in my paper.	45%

in two bands of grade point average scores: above 3.5 and below 3.5. This analysis provided several insights into the data set.

In response to a question about the number of sources needed for a paper, there was a statistically significant variation in the selection of items ($X2 = 21.773$, $df = 2$, $p < .001$). Only 23 percent of subjects with a high grade point average indicated they "meet the minimum that is needed for the assignment," while 50 percent of those with a grade point average below 3.5 chose that option (see Table 7).

When asked whether they could determine if a site was authoritative, there was a moderate difference in selection based on grade point average, with the 63 percent of subjects with a grade point average above 3.5 indicating they could make that determination versus 60 percent of the subjects with a grade point average below 3.5 (see Table 8).

TABLE 8
Question: When viewing a website that a search engine retrieved, it is usually possible to determine whether the site is authoritative.

GPA	Response	Percent
Above 3.5	I do not understand what is meant by authoritative in this question.	31%
	False	6%
	True	63%
Below 3.5	I do not understand what is meant by authoritative in this question.	34%
	False	6%
	True	60%

When asked whether a search engine returns accurate information, there was a moderate difference in selections based on grade point average (see Table 9). Thirty-two percent of those with a grade point average above 3.5 chose TRUE versus 26 percent of those with a lower grade point average.

When asked if they were interested in learning more about information seeking skills, there was a moderate difference in selection (see Table 10). When queried about whether or not they felt information evaluation was an important life skill, one that would impact their future career, there was a more notable distinction in selection: respondents with a grade point average above 3.5 were more likely to respond with a definitive yes than those with a grade point average below 3.0, 71 percent and 62 percent, respectively (see Table 11). Other choices were also indicative of more interest in information evaluation skills relative to the student's grade point average.

TABLE 9
Question: I believe the pages listed in a search engine's results usually contains accurate information

GPA	Response	Percent
Above 3.5	False	6%
	True	32%
	Neither true nor false	63%
Below 3.5	False	2%
	True	26%
	Neither true nor false	72%

TABLE 10
Question: If possible, would you be interested in learning more about improving your information seeking skills?

GPA	Response	Percent
Above 3.5	Might or might not	35%
	Definitely yes	22%
	Probably yes	27%
	Definitely not	6%
	Probably not	11%
Below 3.5	Might or might not	32%
	Definitely yes	19%
	Probably yes	34%
	Definitely not	3%
	Probably not	12%

TABLE 11
Question: Do you believe evaluating information will be important aspect for decision-making in your future career?

GPA	Response	Percent
Above 3.5	Definitely yes	71%
	Probably yes	25%
	Might or might not	4%
	Probably not	1%
Below 3.5	Definitely yes	62%
	Probably yes	31%
	Might or might not	4%
	Probably not	3%

Findings

We identify a total of seven findings based on analysis of the data from our sample. The following three findings concern the comparisons between Millennials and Generation Z students:

1. The selections of Generation Z students in the 2020 survey sample, relative to Millennial students surveyed in 2014, suggest more attention and concern about the quality of internet sources, specifically the authoritative and accuracy qualities of the internet sources. These results were statistically significant.
2. The selections of Generation Z students in the 2020 survey sample, relative to Millennial students surveyed in 2014, suggest a change in the search behavior. The 2020 sample indicated that they are more likely to evaluate a site and showed an increase in the selection of a number of the purposive characteristics of the search process (e.g., the page owner is selling something, the author is promoting an opinion). This suggests that the 2020 sample is reporting a more nuanced evaluation of the bias or purpose of an internet source. These results were statistically significant.
3. The selections of Generation Z students in the 2020 survey sample, relative to Millennial students surveyed in 2014, suggest they are more inclined to search for and use as many sources as needed for an assignment. These results were statistically significant.

Examining the Generation Z sample data specifically, yielded the four following findings:

1. In our Generation Z sample, gender appeared to be a discriminator in the reporting of information search skills, with females making selections which suggest more caution in their reporting of information search skills online, and males more confident in their search skills online. Conversely, in this sample, females made selections which suggest more confidence in their use of library databases than their male counterparts. These results were statistically significant.
2. In our Generation Z sample, grade point average appeared to be a discriminator in the number of sources selected for a research effort, with higher-GPA Generation Z respondents more likely to report that they "find enough quality sources needed to support their research report." These results were statistically significant.
3. Respondents with a higher grade point average appeared to be more discriminating when selecting internet sources; their selections indicate that they could determine if a site is authoritative and contains accurate information.
4. Generation Z respondents with a higher grade point average were more likely to respond that they were interested in receiving additional information-seeking instruction, and were more likely to consider information evaluation an important life skill.

Findings three and four above did not meet the threshold for statistical significance; however, descriptive statistics did provide some indication of the finding reported.

Discussion

Generation Z Females Less Confident in Information Seeking

Consistent with the findings of Taylor & Dalal,[87] females in our sample appear to be less confident in their internet information search skills than males. We consider the consistency of the gender-specific characteristics across two samples six years apart to be a major finding. This lack of confidence based on gender could be a consequence of gender-specific penalization for confidence or self-promotion[88] because females receive greater recognition when they are perceived as modest.[89] More research is needed to determine the impact of gender role

socialization on information literacy attitudes and perceptions in both Millennial and Generation Z students. However, the 2020 survey did indicate the female respondents showed more confidence than males in their library database searches. As these databases are considered higher quality sources of information, relative to the internet, this could indicate that females in our sample are more focused on finding quality sources than their male counterparts.

Millennial and Generation Z comparisons

This study's comparison of Millennials and Generation Z students reveals some trends which may reflect continued information literacy efforts in higher education and K-12 schooling. For example, Generation Z students in our sample appear to be more discriminating in the areas of authority and accuracy of internet sources, as well as more interested in gathering an appropriate number of sources for a research effort. These are both positive information literacy attitudes and perceptions and generally associated with good information literacy skills. However, the Generation Z students were less likely to evaluate the bias of a site, an attitude which runs counter to good information literacy skills.

Authority and Number of Sources

The study's finding that Generation Z is more likely to try to determine the authority of information sources may indicate that previous information literacy instructional efforts in K-12 education have had an impact on this generation. There is some support for this in current literature. For example, a respondent in Head et al. commented that, as students, they were taught not to trust authority of sources (and thus try to determine sources), even the authority of their teachers.[90] Likewise, Nygren and Guath's participants stated they were taught not to trust everything and had practice in fact-checking as part of their education.[91] The literature indicates this is commonplace in education. For example, Smith found that peer teachers in each discipline were encouraged to teach students to practice evaluating information sources because internet resources are not filtered.[92] Hatlevik and Hatlevik also discuss the influence of teachers on the students' ability to evaluate information.[93] This finding is also supported by Cole et al. who found that seventy-four percent of their Generation Z respondents agreed with the statement "you should keep searching even when the first few sources on a topic seem to answer the question or help complete an assignment."[94]

Additionally, increased emphasis on teaching students how to evaluate sources is evident in recently published K-12 educational standards. The American Association of School Librarians' *Standards for Learners* includes multiple performance objectives considering the evaluation of sources.[95] Librarians are often considered the experts in information literacy; however, including information literacy skills in subject-specific standards—such as the *Next Generation Science Standards* including "Obtaining, Evaluating, and Communicating Information" as one of the eight Science and Engineering Practices[96]—will also help to bring information literacy skill to all students.[97]

Bias

Our finding that Generation Z subjects were less inclined to evaluate the bias of an internet information source than their Millennial counterparts contradicts other findings which appear to show Generation Z being more nuanced and careful in their evaluation of information sources. However, the ability to truly evaluate depends on understanding the context in which informa-

tion exists. The ACRL Standards state that an information literate student "recognizes the cultural, physical, or other context within which the information was created and understands the impact of context on interpreting the information"[98] and the ACRL Framework encourages students to be skeptical, open to new voices, and understand that biases exist; however, this is a difficult skill for students to develop since they are used to selecting sources based on relevance,[99] or the author's expertise.[100] It is also possible that students in this study's sample have been instructed to use a variety of sources and to be cognizant of the information source's purpose when they write their research papers. Research supporting this has found that students often believe a source in a library database is safe to use, and therefore do not consider any other criteria (e.g., bias), believing that library databases only include authoritative information sources.[101] In Head et al., students shared that professors tell students that library databases are guaranteed to contain acceptable sources.[102] Young and Von Holten also criticize the librarian practice of focusing on authority with peer-reviewed articles suggesting that this encourages a binary view of the evaluation of sources; the researchers further share how this view informed their pedagogy to encourage students to think of who would publish a piece of information and why.[103]

The practice of not evaluating the bias of a website is also troublesome as it runs counter to good information literacy practice. This strengthens the argument that information literacy training is needed all the way from kindergarten through to higher education so that college students will be able to apply appropriate information source evaluation criteria.

Grade Point Average and Information Literacy

Analysis of the results from this sample provide some confirmation that student grade point average is a discriminator in good information search behaviors such as selecting a good database for their search, and being more discriminating in their evaluation of sources, as indicated by their tendency to select sources other than the internet. Likewise, this sample of Generation Z students provides some indication that grade point average is a discriminator in the recognition of information literacy as an important life skill, as well as in the pursuit of an opportunity to improve their information literacy skills.

This study found that Generation Z participants who cite a higher number of sources and who are more likely to use library databases, self-report as having a higher overall grade point average. This finding is supported by the existing literature which reports that undergraduate students who use library services have a higher overall grade point average.[104] The subjects in this study who were more inclined to evaluate sources for authority also reported having a higher overall grade point average. Banik and Kumar's research study supports this finding and suggests that applying information literacy skills may increase a student's GPA by .012.[105]

However, there is also conflicting literature regarding whether students know how to evaluate for authority or apply any other information literacy skills. Lanning and Mallek suggest that even good students do not have the information literacy skills expected for higher education and that there is a need for formal information literacy skills training in higher education.[106] Thoroughly exploring the impact that student attitudes and perceptions have on their GPAs would likely require its own in-depth study.

Information Literacy Instruction

Generation Z participants in this research study appear to support and have an interest in formal information literacy skills instruction conducted by academic libraries. Generation Z

students know that information literacy is an important life skill and want library instruction to develop these skills. While library information scholarship continues to support academic initiatives to develop students' information literacy skills,[107] there has been little research on whether Generation Z students would support these initiatives and be motivated to learn and apply these skills.

Conclusion

The purpose of this quantitative exploratory study was to examine the trends of information seeking behaviors, particularly the information literacy attitudes and perceptions of Generation Z higher education students in comparison with Millennial higher education students, at a small, private university in New Jersey. Our findings indicate that, when compared with Millennial participants, Generation Z students were more attentive and concerned about the quality of internet sources, less inclined to evaluate information, more attentive to the bias of those sources, and were more inclined to search for and use sources as needed for an assignment.

Our findings included some indications of gender as an influence on information literacy skills, with females in our sample reporting less confidence in their internet information search skills than males. We consider this across two samples six years apart to be a major finding and to be indicative of a gender-specific tendency in information literacy skills that deserves further study.

Our findings also indicate other differences between Millennials and Generation Z participants, such as Generation Z female students reporting more confidence in their use of library databases. In addition, Generation Z students who self-reported a higher grade point average were more likely to indicate an interest in receiving additional information seeking instruction, and were more discriminating in their selection of internet resources. While these results did not reach the threshold for statistical significance, the descriptive statistics reported here do provide some indication of the influence of grade point average on information literacy skills, which other studies support. The sum of these findings suggest that Generation Z may be more interested in obtaining quality resources for their assignments, which may indicate that information literacy training has impacted these students. These findings also indicate that Millennial and Generation Z students are unique cohorts, and that practitioners should therefore avoid lumping the generations together.

While these findings add to the body of scholarship regarding Generation Z students and information literacy, they are not generalizable beyond the sample described previously. Therefore, more research on how Generation Z practices information literacy behaviors is needed to be able to influence librarian practitioners.

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