Potential for digital writing transfer with infographics: Students' perspectives

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Abstract

Between 2020-22 COVID-19 blurred the line between academic and digital writing as more students and educators used digital platforms to write, share, and collaborate on academic work. Today, students can video-conference, engage in digital annotating, communicate via chats with different audiences, and write more audience-oriented emails - some of the skills they transferred from their daily interactions prompted by the pandemic. To help the students enhance their digital writing skills needed to succeed in the post-pandemic world, the researcher of this study decided to introduce and implement infographics in her first-year composition. During the pandemic, this genre became one of the popular mediums for transmitting and sharing information, with public health organisations worldwide relying on them to illustrate the scale of the crisis and the actions needed to combat it. This exploratory study collected data from 13 students in a blended college-level writing course by employing qualitative research methods such as surveys and reflections to learn about students' perspectives on possible affordances and constraints of infographics and to discover a more robust understanding of infographics as a potential tool for digital writing transfer. A thematic analysis was used to code students' responses. The literature review and the findings of this study suggest that infographics can be used as a tool to improve intellectual skills (e.g., audience awareness, information filtering, concision) and life skills (e.g., self-efficacy), which are both needed for more effective digital writing skills required for success in the post-pandemic world.

Practitioner Notes

1. COVID-19 has blurred the line between academic and digital writing; thus, implementing practices that can enhance students' digital writing skills becomes necessary.
2. With the transition to online learning, students are now utilising digital mediums for interacting and engaging with their peers and teachers, which has forced them to develop audience awareness, information filtering, and concision skills.
3. Due to increased popularity during the pandemic, infographics can help students advance their intellectual skills (e.g., audience awareness, information filtering, and concision) and life skills (e.g., self-efficacy), all needed to enhance digital writing skills.
4. By teaching students how to read, interpret, and create infographics, instructors across various disciplines can promote digital writing transfer from their classrooms to the job market.

Keywords

Introduction

With recent technological developments and a variety of digital tools, the notion of writing has changed profoundly: uploading photos, streaming live videos, commenting on the posts of others, and posting reactions to events via memes are a few examples of current writing habits around the world (Şentürk, 2021). Nevertheless, as reports on students' anxiety and stress levels indicate (Reilly, 2020; Dodd et al., 2021), during the switch to remote learning, not all were ready to be immersed entirely in online-only interactions. The COVID-19 pandemic paused most in-person interactions, pushing many students out of their comfort zones and into daily interactions where the audience and purpose had to be carefully considered if they wanted to open a bank account, register for classes, get financial assistance, or seek medical help. Overwhelmed by phone calls, many companies and institutions incorporated [chatbots, or 'conversational bots'] into their websites to establish a direct connection with the consumer" (Vázquez-Cano, 2021, pp. 1-2). Users started reflecting on their word choice to be understood by these chatbots. All these online-only interactions - in daily, academic, and professional settings - gave students "autonomy, responsibility, flexibility, and choice" (Sumer et al., 2021, p. 1). Thus, having strong digital writing skills became a priority for the students. COVID-19, has blurred the line between academic and digital writing. Many educators and students use digital platforms like Google Docs to collaborate on their work, share ideas and write. Building on their previous digital experiences, students began increasing their proficiency in communicative skills. Based on the researcher's observations, students can video-conference, share their screens, engage in digital annotating, communicate via chats with peers and instructors, and write more audience-oriented emails - some of the skills they were able to transfer from their daily interactions prompted by the pandemic.

Pre-pandemic research suggests that many instructors attempted to inspire this so-called "writing-transfer-mindset" to help students "transfer writing knowledge and practice" (Yancey et al., 2018, p.42) that they acquired through various digital tools and social media platforms into academic contexts. Considering students' preferred information formats, such as concise textual content with visual and/or auditory aids (Alford, 2019, p.158), instructors across the disciplines have been implementing social media platforms such as Facebook, Instagram, Twitter, and Pinterest to raise "the skills of visual literacy, student engagement, interaction and communication with peers in the classroom" (Bicen & Beheshti, 2017, p. 100).

Research shows that the pandemic amplified the demand for and reliance on concise textual formats, preferably with visual aids (Chan et al., 2020; Hamaguchi et al., 2020; Jacob, 2020). The World Health Organization (WHO), the United States Centers for Disease Control (CDC) and other public health organizations worldwide turned to infographics to quickly and clearly convey complex information using textual and visual elements (Dalen, 2021; Yecora-Santos, 2022). These "visual

representations of information" (Mendenhall & Summers, 2015) have been used to illustrate the scale of the crisis and the actions needed to combat it. From illustrating the spread of the virus to highlighting the importance of social distancing and wearing face masks, these infographics became a powerful tool for raising awareness in an easily digestible format. With infographics becoming a popular medium for transmitting and sharing information, the researcher of this study decided to introduce and implement this genre in her first-year composition (FYC) to help the students enhance their digital writing skills needed to succeed in the post-pandemic society. Additionally, since the site of this study is a transferable college-level writing course, practising creating infographics can help instructors transfer digital writing to other courses and beyond.

Using qualitative research methods, namely students' surveys and reflections, this exploratory study aimed to learn about students' perspectives on possible affordances and constraints of infographics to discover a more robust understanding of infographics as a potential tool for digital writing transfer. As a result, this paper provides the following:

1. a literature review on applications, benefits, and limitations of integrating infographics into undergraduate curriculum across the disciplines but with emphasis on FYC courses;
2. an overview of the research design, including theoretical framework and methods used to code student survey responses and generate them into themes;
3. a discussion and possible implications of the two identified themes - intellectual and life skills that can help students enhance their digital writing skills and thrive in the post-COVID-19 pandemic world;
4. further research directions.

Literature Review

Scholars across the fields traced the history and evolution of infographics to explain the importance and relevance of this genre today (Smiciklas, 2012; Krum, 2013; Crane, 2015; Dick, 2020). The earliest example dates back to the Late Stone Age, during which prehistoric people drew animal-like figures inside their caves (Smiciklas, 2012; Krum, 2013; Crane, 2015). A combination of written descriptions with illustrations, which resembles some of the modern infographics, was famously used by Leonardo da Vinci in his guide to human anatomy (Smiciklas, 2012; Crane, 2015). According to Lankow et al. (2012), until the Internet became accessible to the public, academics and scientists studied and developed new ways to visualise information to audiences outside their fields. Around the 2000s, infographics became mainstream (Krum, 2013). Today, "digital advertisements, memes, social media posts, online periodicals, and advocacy websites - all use infographics to make arguments and inform audiences online" (Alford, 2019, p.158; Dick, 2020).

Infographics combine different characteristics. For example, Lankow et al. (2012) explain that infographics involve "illustration, large typography, and long, vertical orientation displaying an assortment of facts." Some scholars describe infographics as a visual representation of information via charts and graphs (Krum, 2013; Crane, 2015). Alrwele (2017) characterises an infographic as "a composition of concise explanatory text and visual representations that are

blended to convey a story-like message that is attractive and easy to understand [using] pie charts, bar graphs, zoom boxes, histograms, icons, line charts, tree diagrams, and even pictures" (p.105). Taspolat et al. (2017) added drawings, paintings, sound, and video to the list while describing interactive or live infographics.

Regarding applications and benefits, infographics have a broad disciplinary reach. So far, the research has been done in the fields of social work (Jones et al., 2019), mathematics (Baglama et al., 2017), nursing (Chicca & Chunta, 2020), public health (Shanks et al., 2017), design (Ru & Ya Ming, 2014), chemistry (Kothari et al., 2019), biology (Dehghani et al., 2020) among others. For example, Toth (2013) appeals to business and professional communication instructors to include infographics in their curriculum because of their intended purposes, such as "presenting information clearly and succinctly, targeting audiences, defining clear purposes, developing ethos, understanding document design principles, using persuasion techniques effectively, branding, and conducting and summarising research" (p. 451). Most of these purposes echo the learning outcomes of undergraduate writing courses (Lindblom et al., 2016; Krishnan et al., 2020; Smothers, 2021). According to Toth (2013), students will benefit from analysing the genre of infographics by looking at examples and then producing their infographics. Some websites with sample infographics include Cool Infographics (http://www.coolinfographics.com), Visual.ly (http://www.visual.ly), and Daily Infographic (http://www.dailyinfographic.com) (Toth, 2013, p.448). Years later and in a different field, Jones et al. (2019) confirmed the benefits for the students in creating their infographics to improve communication and advocacy skills and "simultaneously develop digital literacy and social work skills" (p.18). McEntee (2019) added "information filtering" to that list (p. 163). Furthermore, Jones et al. (2019) emphasised that based on the students' surveys, creating an infographic was "appropriate even for students" with limited knowledge of and experience with technology (p.18).

In addition to enhancing intellectual skills, infographics can develop students' life skills and attitudes, such as decision-making, self-confidence, motivation, and teamwork (Alrwele, 2017; Bicen & Beheshti, 2017; Alyahya, 2019; Jones et a., 2019; Cheng et al., 2021). For example, in the study conducted by Alyahya (2019), students expressed excitement over creating their infographics, with one stating, "It motivates learners because it allows implementing their own experience and point of view" (p. 11). Furthermore, citing neuroscience studies, Cheng et al. (2021) proved that instructor-created infographics have the potential to send "subtle feedback and messages related to a growth mindset" (Dweck, 2008) that can positively affect students' attitudes and motivations (p.1346). Cheng et al. (2021) also found that "infographics stimulate reflexivity, promote resilience in learning, foster self-validation, cultivate perseverance and possibility thinking in the face of challenges, instigate new ways to handle failures, and facilitate self-understanding among students" (p. 1358). In the study conducted by Alrwele (2017), after viewing and analysing sample infographics and then creating their own, participants "reported that infographics improved their appreciation for teamwork, fostered their motivation to learn, and gave them more self-confidence in their ability to learn and succeed" (p. 112). Thus, in addition to enhancing their intellectual skill such as audience awareness, concision, and information filtering, infographics can also increase students' sense of self-efficacy.

Nevertheless, some scholars identified potential problems with creating infographics that writing instructors must consider and discuss with the students (Arslan & Toy, 2015; Krum, 2013). One common problem while creating an infographic is the wrong choice and application of visual elements. Arslan and Toy (2015) state that the "wrong choice of colour or typography for a specific subject in the making of an infographic may result in the reader or viewer's misunderstanding of the content of the subject" (p.410). The attention that needs to be given to the selection and application of visual elements implies the necessity for more extensive and ongoing practice with analysing and creating infographics - something that's not always feasible in college writing courses, either due to time constraints or limited teacher's training (Alford, 2019). Another potential problem that can arise while creating an infographic is related to content selection. According to Krum (2013), "all data visualisation is biased…[because] by putting numbers into context for readers, the designer [of an infographic] is shaping the perception of the values" (p. 19). On the other hand, writing instructors can turn this problem into an example and a discussion about the necessity for collecting credible, reliable, and up-to-date sources.

Despite the concerns over the biased presentation of the information, in the context of the COVID-19 pandemic, infographics have been used to simplify complex data, improve public knowledge, and reduce cognitive burden (Chan et al., 2020; Jacob, 2020). Governments worldwide have been using infographics to aid public understanding of the pandemic and its effects. Countries have been sharing their infographics to provide a detailed description of the current situation and to analyse the trends, which has been particularly useful in areas where access to reliable information is limited (Chan et al., 2020; Hamaguchi et al., 2020). For example, a group of researchers "developed two bilingual infographics…to educate Latino/a immigrant cattle feedlot workers and their families" on "specific work-related practices" to minimise the risk of contracting or transmitting the virus and suggestions for the management of pandemic-related stress and anxiety (Hamaguchi et al., 2020, p.354). By posting those infographics on different social media platforms, the researchers discovered that thousands of Spanish-speaking farmworkers could interact with the infographics through sharing or liking (Hamaguchi et al., 2020, p.355).

With infographics becoming a popular medium of transmitting and sharing information, especially since the beginning of the pandemic, this study recommends adopting infographics as a tool for enhancing digital writing skills in college students. Previous research has shown that infographics can help students learn how to organise their thoughts and ideas better and present information clearly and concisely. Additionally, creating an infographic can help students develop essential skills such as research, data analysis, and visual design. These skills can be valuable for digital writing and other forms of communication in the digital world.

Teaching Context

The study took place at a community college in the Midwest region of the United States of America. This college offers transferable programs to 4-year universities, certificates, career programs, apprenticeships, adult literacy and English as Second Language programs, dual credit courses for high school students, and personal enrichment programs for different ages. The college also offers entirely online and blended (partially on-campus and partially online) classes. According to the college website, student demographics include recent high school graduates,

veterans, students with disabilities, students of colour, first-generation, LGBTQ, athletes, and multilingual students.

This study was conducted in a blended transferable college-level writing course called English 121: English Composition I, which met twice a week over Zoom, a video conferencing platform, for three hours over eight weeks in the summer of 2022. The study received ethical approval to collect short written responses to the survey questions and anecdotal comments before publication. One limitation of this study is the number of participants: out of 16 registered students, only 13 participated. All students gave informed consent. Students completed the surveys and reflections anonymously, using the *Ungraded Survey* option under the *Quizzes*, available through the college's learning management system, Canvas.

During the course, students had opportunities to analyse and produce writing in different genres. To meet two of the college course objectives: "Us[ing] questions about the rhetorical context (e.g., audience, purpose, and genre) to be an *actively* engaged reader of various texts and resources" and "Engag[ing] with multimodal approaches for generating, investigating, and representing ideas," students completed the Infographics Project. In the assignment, students remixed their opinion-based essays into infographics, using the same sources but reconsidering the audience, purpose, and content. Here, the act of remixing stands for a literacy practice (Knobel &Lankshear, 2008) "that involves the deliberate manipulation of previous passages, clips, or samples throughout a majority of the work" (Stedman, 2012, p. 108). The Infographics Project consisted of two main parts – an Infographic and an Artist Statement. Through the creation of infographics, students practised filtering the existing information, choosing a physical space to display their infographics, and, based on the chosen place, selecting a purpose and an audience (Hafner, 2015; Lohani, 2019). While writing their Artist Statements, students practised metacognitive thinking or self-reflection (Desautel, 2009) and explained their rhetorical choices to the teacher "as a means of guiding assessment" (Fiscus, 2017). The project was scaffolded into stages to minimize stress and anxiety in those students who have not worked with infographics before (Howell, 2018) and to facilitate self-reflection on the affordance and constraints of infographics in the form of sequenced surveys.

Research Design

Inspired by the theory of high road transfer and "bridging" instructional strategy proposed by Perkins and Salomon in 1989 and 1992, respectively, the researcher of this study was set to identify "general principles among different events in different contexts and [deliberately] search for connections among their structures" (Hajian, 2019). "General principles" here refer to skills that students employ while working with a text, both from a sense of understanding and creating it. "Different contexts" refer to written and visual texts between which standard "connections among their structures" are being identified. Additionally, the design of this research was influenced by two strands of research: (1) metacognitive research that prompted to create of survey questions that "engaged [students] in thinking about themselves, the nature of learning tasks, and the social contexts" (Lin, 2001, p. 23), and (2) learner-oriented research that allowed to examine students prior knowledge of (Robertson et al., 2012) and dispositions (Driscoll & Wells, 2012) towards infographics.

This study used exploratory and qualitative approaches to collect data in the form of students' surveys and reflections. "Questionnaires are good for gathering data about abstract ideas or concepts that are otherwise difficult to quantify, such as opinions, attitudes and beliefs" (Artino et al., 2014, p. 464). The researcher acknowledges that surveys can have limitations in this study, such as possible subjective interpretation of open-ended questions (Miles et al., 2014). So, during two 3-hour class periods, students were asked to complete three short surveys (2-4 questions each), each connected to a specific stage of learning about and creating infographics. The first survey was administered before the Infographics Project was introduced to learn about students' prior knowledge of the subject (Robertson et al., 2012). There were four questions in Survey 1:

(1) Have you worked with infographics before? If yes, in what context(s)/course(s)?

(2) What are some initial questions/concerns you have about infographics? If you have never worked with infographics before, think about the word itself - what does the word "infographics" mean/imply to you?

(3) What challenges do you anticipate while *reading and understanding* infographics?

(4) What challenges do you anticipate while *creating* your infographics?

Then, students reviewed sample infographics collected through different open educational resources. After discussing each infographic's strengths and weaknesses as a class, students joined breakout rooms automatically generated by Zoom. In small groups of two or three, students accessed a pre-planned Google Doc created for a group discussion (Morse, 2021), in which they had to identify and record rules for creating successful infographics. After students regrouped in the main room, they discussed their responses as a whole class. Then, students completed Survey 2, which contained the following two questions:

(1) After reviewing sample infographics and discussing their various designs and purposes, describe criteria for effective infographics – in other words, what are some rules we need to follow to create effective infographics?

(2) After reviewing sample infographics and discussing their various designs and purposes, what questions/concerns do you have about creating your infographics using the information from your Opinion Piece?

The purpose of the first question was to assess students' understanding and promote retention of the new knowledge through repetition of the material. The second question presented students with another opportunity to critically reflect (Lin, 2001; Chakma et al., 2021) on and draw connections with their initial questions and concerns about creating infographics.

While researching the easy-to-use open-access infographic software, the author of this paper found the following website: canva.com, an online design and publishing tool that can be used for free online and via a smartphone. Tutorials for every step of the creation process. So, after administering the first two surveys, an overview of the website Canva.com was given to the students. The website offers free and paid plans, but the free version has enough templates, elements, and editing features. Additionally, tutorials were available for every step of the creation

process. As a homework assignment, students had to create infographics, following the rules they had identified earlier in the class. During the next class period, after students created their infographics, Survey 3 was administered in which students responded to the following two questions:

> (1) How comfortable do you feel about creating infographics in your other courses and/or job–related context? (1=not comfortable, 2=somewhat comfortable, 3=comfortable, 4=very comfortable).
> (2) In what context(s) do you see yourself creating infographics?

The first question was designed using the four-point Likert scale to assess students' comfort level in creating infographics. The researcher used the four-point scale to avoid having "neutral" responses (Garland, 1991). The second question sought to learn about students' perspectives on the infographics' potential to promote writing transfer, which was one of this study's initial research aims.

After completing all three surveys, students composed a 500-word reflection in which they had to reflect on their rhetorical choices to create their infographics (Robertson et al., 2012). A sample reflection from a former student (who agreed to share their work) was studied and analysed to prepare students for this final assignment. Many writing scholars believe that modelling "is an important means for acquiring literacy skills, beliefs, attitudes, and behaviors" (Rosenthal & Zimmerman, 1978, as cited in Schunk & Zimmerman, 2006, p. 11)

To analyse students' perspectives, through both surveys and reflections, on possible affordances and constraints of infographics to discover a more robust understanding of infographics as a potential tool for writing transfer, the researcher used thematic analysis (TA). Using TA allowed to prioritise participants' experiences over the researcher's interpretations (Braun & Clarke, 2012, p. 59). While applying TA to the collected data, the researcher used "an inductive approach to data coding and analysis [which allowed to] derive [codes and then themes] from the content of the data themselves—so that what is mapped by the researcher during analysis closely matches the content of the data" (Braun & Clarke, 2012, p. 58). The keywords were identified from student responses to questions #3 and 4 in Survey 1 and question #2 in Survey 2 and used as codes which later were categorized into two main themes - intellectual skills and life skills - based on the benefits of working with infographics in a classroom identified through the literature review.

Findings

According to Survey 1, which asked students about their previous experience with or knowledge of infographics, 10 out of 13 said they were unfamiliar with the genre. One student said they never created their infographics but saw some examples in high school. Two students noted that they have worked with infographics before in the science-related field "to communicate very technical information to people who are not in the sciences" (Student 1) and in the field of information technology "to display system network specifications, the flow of data, and pros/cons of certain network structures" (Student 2). These two statements illustrate the significance of teaching our

students to analyse, evaluate, and create infographics because of their applicability in different career fields and potential for writing transfer.

While answering the second question of Survey 1, students had two options: (1) to share their initial concerns or questions about infographics, or (2) if they have never worked with infographics before, to explain what the work infographics meant to them. Even though only two of the 13 surveyed students stated that they had worked with infographics before, most students clearly understood what infographics were. Some could build connections based on their prior knowledge (Robertson et al., 2012). For example, some common responses to the question "what does the word "infographics" mean/imply to you?" included "some kind of data collection," "a graphic picture that gives me a fair amount of information," and "a visual representation of information." Those students with the prior knowledge stated: "Infographics means to me, the informational picture like things you may see at a museum, zoo, and aquarium" (Student 1) and "When I think of infographics, I imagine the doctor offices with pamphlets or posters discussing health issues or advocates on social media talking about a cause like a climate change for example" (Student 2). Writing instructors can facilitate knowledge transfer between contexts by encouraging students to identify similarities between their prior knowledge and the new material.

Table 1 provides an overview of the remaining students' responses that the researcher coded, using students' word choice, and then categorized into two themes – intellectual and life skills, based on the benefits of working with infographics in a classroom identified through the literature review. The researcher acknowledges that some quotes can fit under multiple codes, but the theme will remain the same. The number of times each code was mentioned throughout students' responses illustrates how many students identified those codes as challenging. Even though most of the questions from the three surveys aimed to identify some of the challenges students encountered during different stages of working with infographics, the researcher chose to code and categorize them into different types of skills rather than challenges, following the growth mindset pedagogy (Dweck, 2008).

By looking at the generated codes, writing instructors can notice that the students identified challenges similar to those in most learning outcomes of the FYC courses, which can signal students' readiness to work on and enhance those areas of concern. Based on the sample student survey responses, some students had more experience with and knowledge of infographics. However, along with physical challenges of reading, understanding, and designing infographics, some students mentioned a cognitive challenge of low self-efficacy (Margolis & McCabe, 2006; Lavelle, 2009; Shin, 2018), and one expressed concern over work-life balance/time management (Reilly, 2020; Eri et al., 2021).

After students had time to process new knowledge and create their infographics, they completed the last survey during the next class period. While rating their comfort level of working with infographics, three students said that they felt very comfortable. Six students stated that they felt comfortable. Two students put "somewhat comfortable," while one put 2.5, slightly above "somewhat comfortable." One student stated that they still felt uncomfortable creating their infographics. Based on the results, most students feel comfortable creating infographics on their own with the given platform.

Table 1

Summary of Student Responses, Generated Codes and Corresponding Themes Across 3 Surveys and a Reflection

Codes / number of times mentioned	Sample Student Survey Responses	
Reading Comprehension / 6	"What are the primary information I need to focus on"	Intellectual Skills
Concentration / 1	"I have trouble focusing while reading"	
Organization / 3	"maybe placement"	
Concision / 1	"The main challenge is being concise. Visual elements with a wall of text leads to confusion, but visual elements with relative quips lead to comprehension. Key words and buzzwords should be used to accentuate core concepts and cardinal information."	
Information Filtering / 7	"Deciding which information is necessary and which is not necessary for the infographic"	
Audience / 3	"As someone who is used to communicating with other scientists using, it might be difficult for me to create effective graphics for people not in the sciences."	
Word Choice / 2	"Clear subject or the story, grabbing the attention, title and tagline"	
Visual Elements / 4	"What style of graphic works best to convey this information? What is my END GOAL picture that I want the audience to understand?"	
General Requirements / 1	"About how long should our Infographics be? What are some requirements that are needed?"	
Source Selection / 1	"Will it matter where and from I'll get my information?"	
Self-efficacy / 4	"I feel like I won't do it right let alone understand how to do it"	Life Skills
Work-life balance/time management / 1	"The primary challenge for me creating this infographic was time. […] My struggle to balance work, family, and school during this time has been a key learning point for me in retrospect, and my time management has improved. […] working with Prof. … and the repository of information online allowed me to review curriculum and assignments when I had the chance."	

(Themes)

Students' ability to name multiple contexts in which they see the applicability of infographics illustrates the possibility for knowledge transfer. Students' understanding of the various contexts in which infographics can be used is key to teaching them how to utilize the tool effectively. Writing

instructors can use this knowledge to guide students toward making more meaningful infographics.

Table 2 demonstrates students' responses to the second question of Survey 3, in which they reflected on infographics' applicability in other contexts besides their college writing course.

Table 2

Infographics' Applicability in Various Contexts: Students' Perspectives

Contexts	Number of times mentioned
work environment	4
college setting	3
work and college settings	2
social media	1
medical field	1
mission statements	1
budgeting and network topologies	1
funding	1

Discussion and Implications

Based on previous research, the COVID-19 pandemic has made students more aware of the importance of communication. With the transition to online learning, students are now utilising digital mediums for interacting and engaging with their peers and teachers, which has forced them to develop audience awareness, information filtering, and concision skills. They must be cognizant of their audience, filter out irrelevant or redundant information, and convey their message concisely and clearly. These skills will help them succeed in the virtual classroom and prepare them for the post-pandemic demands of the job market. Students' responses to the first question of Survey 1 supported an argument made by some experts on infographics who found that "despite the increased use of infographics over the last several years, many people still do not know what they are, nor can they provide a definition or give a synonym for an infographic" (Crane, 2015). However, the majority of the surveyed students named the skills they struggled with during different stages of working with infographics which can suggest their "prior technology experiences and exposure to digital genres" and ability to transfer their previous knowledge onto the new context (Martin & Lambert, 2015; Robertson et al., 2012). Some of the skills students identified across the surveys and the reflection, such as information filtering, audience, and concision, are consistent with the characteristics of effective digital writing (Bergin, 2018; DeVoss & Eidman-Aadahl, 2010; Martin & Lambert, 2015; Yu, 2014). By possessing these skills, writers can create digital content that is engaging and effective.

According to Table 1, information filtering was the most mentioned challenge in creating an infographic. In their reflection, one student said:

> *Another problem I had was getting the main points across while having a lot of information to share. If I were to create this infographic again and had more time to do so, I would have liked to apply more numerical evidence such as charts or percentages.* (Student 4)

Another student stated:

> *Some challenges that I had with my infographic is choosing what kind of information to put on my infographic. Because my topic is such a sensitive topic to discuss, I needed to make sure that it was going to be understandable with the amount of information allowed on it.* (Student 3)

Both students describe the problem of information filtering regarding space and length limitations in their statements. Selecting the most relevant information within the given constraints can be challenging due to a possible loss of nuance or important details (Bergin, 2018; DeVoss & Eidman-Aadahl, 2010). Based on the researcher's experience, practising summarizing complex information in a concise and easy-to-understand way and then seeking feedback from peers can enhance information filtering skills. Also, Bergin (2018) recommends practising audience analysis skills to better tailor the information to the audience's needs and interests.

Table 1 shows that three students were concerned about their abilities to appeal to their audiences successfully. For example, in the reflection, one student said:

> *The first issue I faced was choosing the correct wording for a younger audience; I needed to get the message across without losing the reader's attention.* (Student 4)

This statement shows that the student already begins characterizing their audience by using the word "younger," which can suggest their prior experience with writing for different audiences. In digital spaces, its users easily share and access information; thus, considering the audience to ensure that the message is clear and compelling becomes an essential step. By analysing the audience - their needs, interests, and concerns – students can learn to make their writing more relevant and engaging (DeVoss & Eidman-Aadahl, 2010). Learning to create infographics through experimentation with formats, colours, layouts, and language can enhance students' skills in analysing and appealing to different audiences (Bergin, 2018; DeVoss & Eidman-Aadahl, 2010). Based on the researcher's experience, encouraging students to create infographics for their local community inspires some students to create content in languages other than English.

Another concern, also shared by three students, was concision – a common issue that both novice and experienced writers face while producing any writing. Concision is usually discussed and practised in the academic setting by reviewing sentences, paragraphs, and essays. Concision is particularly important in digital writing because readers often have limited attention spans and

may lose interest if the writing is too long or wordy. By being concise, writers can communicate their message effectively and efficiently (Bergin, 2018; Yu, 2014). The observation made by the student (see Table 1) suggests that infographics that contain both textual and visual elements can be used to practice concision. Considering the word choice is one of the ways to be concise. The researcher of this study recommends helping students create word banks where they list the keywords essential to their topics, and active verbs can be aligned with their purposes. These word banks help students stay focused and prevent them from using irrelevant vocabulary.

Based on the analysis of the surveys and reflections, students identified only two life skills-related challenges – low self-efficacy and work-life balance struggle (See Table 1). This study focuses on self-efficacy only because one's level of self-efficacy may affect their willingness to learn and develop digital writing skills. For example, someone with high self-efficacy may be more likely to try new technologies and learn how to use them effectively for writing, while someone with low self-efficacy may be less likely to do so. For example, one student wrote in their reflection:

> *Challenges I faced were me doubting myself, me thinking I couldn't make sense, me thinking I chose the wrong visuals and text. I would've liked to add more text explaining my statement and maybe even go for a different visual.* (Student 6)

One of the ways instructors can help students with low self-efficacy is by introducing infographics from the beginning of the course and slowly transitioning from the instructor to student-created infographics. A study conducted by Cheng et al., 2021 revealed that a set of infographics that provided students with affirmations and inspirations over a few-week-period "promoted resilience in learning, fostered self-validation, cultivated perseverance and possibility thinking in the face of challenges [and] instigate new ways to handle failures." Even though there is no previous research on the connection between self-efficacy and COVID-19, one's level of self-efficacy may affect their ability to cope with the challenges and changes brought about by the pandemic. Thus, helping students increase their sense of self-efficacy must become one of the priorities in today's academia.

Conclusions and Future Research

In the 21st century, the proliferation of digital technologies has made it more critical for people to navigate and make sense of a wide range of media and communication platforms. As such, the ability to effectively use and understand multiple modes of communication is becoming an essential literacy skill for modern digital writers. One tool to enhance students' digital writing skills can be infographics. Recent studies, including this one, illustrated how COVID-19 affected students' writing habits by creating new and more authentic environments where students can consider their contexts and audiences. Because the pandemic was able to blur the line between academic and digital writing, now is the time for instructors across disciplines to tap into their students' digital writing habits and continue enhancing them in their classrooms. This exploratory study illustrated students' perspectives on possible affordances and constraints of infographics as a means of discovering a more robust understanding of infographics as a potential tool for promoting digital writing transfer. This study supported previous research stating that working with infographics, either through instructor-created or student-created infographics, creates "a rich

environment" that helps students enhance their "learning skills, motivation, [and] creativity" (Bisen & Beheshti, 2017, p. 106). Based on the literature review, the student-identified intellectual skills (e.g., information filtering, audience, and concision) and life skills (e.g., self-efficacy) are consistent with the characteristics of effective digital writing (Bergin, 2018; DeVoss & Eidman-Aadahl, 2010; Martin & Lambert, 2015; Yu, 2014). Thus, by teaching students how to read, understand, and create infographics, instructors can help enhance students' digital writing skills.

Hopefully, this study will inspire instructors to experiment with infographics using them as:

1. an assessment tool that can identify the areas that students struggle with and work on those areas throughout the course,
2. a scaffolding strategy where an infographic takes on the role of brainstorming or mapping exercise,
3. an instructor-provided summary of the new materials for a more productive discussion.

Additionally, the researcher recommends spending more than just two 3-hour class periods working with infographics and including a multi-stage peer review during which students can evaluate each other's work (Maamuujav et al., 2019). Since this study identified only two main categories of skills that can be learned and practised through reading, analysis, and creation of infographics, future research could look into the codes that were chosen to describe the data and study them individually.

Conflict of Interest

The author(s) disclose that they have no actual or perceived conflicts of interest. The authors disclose that they have not received any funding for this manuscript beyond resourcing for academic time at their respective university.

References

Alrwele, N. S. (2017). Effects of infographics on student achievement and students' perceptions of the impacts of infographics. *Journal of education and human development*, *6*(3), 104-117. http://jehdnet.com/journals/jehd/Vol_6_No_3_September_2017/12.pdf

Arslan, D., & Toy, E. (2015). The visual problems of infographics, Global Journal on Humanities & Social Sciences. [Online]. 01, pp 409-414. Available from: http://www.world-education-center.org/index.php/pntsbs

Artino, A. R., Jr, La Rochelle, J. S., Dezee, K. J., & Gehlbach, H. (2014). Developing questionnaires for educational research: AMEE Guide No. 87. *Medical teacher*, *36*(6), 463–474. https://doi.org/10.3109/0142159X.2014.889814

Baglama, B., Yucesoy, Y., Uzunboylu, H., & Özcan, D. (2017). Can infographics facilitate the learning of individuals with mathematical learning difficulties. *International Journal of Cognitive Research in Science, Engineering and Education*, *5*(2), 119-128. https://tinyurl.com/5fafwnkf

Bergin, J. (2018). "Entering the Digital Commons: Using Affinity Spaces to Foster Authentic Digital Writing in Online and Traditional Writing Courses," *The Emerging Learning Design Journal*: Vol. 5: Iss. 1, Article 1. https://digitalcommons.montclair.edu/eldj/vol5/iss1/1

Bicen, H., & Beheshti, M. (2019). Assessing perceptions and evaluating achievements of ESL students with the usage of infographics in a flipped classroom learning environment. *Interactive Learning Environments*, *30*(3), 498-526. https://doi.org/10.1080/10494820.2019.1666285

Braun, V., & Clarke, V. (2012). Thematic analysis. In H. Cooper (Ed.), *APA Handbook of Research Methods in Psychology*: *Vol. 2. Research Designs* (pp. 57-71). American Psychology Association. doi:10.1037/13620-004

Chan, A. K. M., Nickson, C. P., Rudolph, J. W., Lee, A., & Joynt, G. M. (2020). Social media for rapid knowledge dissemination: early experience from the COVID-19 pandemic. *Anaesthesia*, *75*(12), 1579–1582. https://doi.org/10.1111/anae.15057

Chakma, U., Li, B., & Kabuhung, G. (2021). Creating online metacognitive spaces: Graduate research writing during the covid-19 pandemic. *Issues in Educational Research*, *31*(1), 37-55. https://search.informit.org/doi/epdf/10.3316/informit.748747335200300

Cheng, M. W., Leung, M. L., & Lau, J. C. H. (2021). A review of growth mindset intervention in higher education: the case for infographics in cultivating mindset behaviors. *Social Psychology of Education*, *24*(5), 1335-1362. https://doi.org/10.1007/s11218-021-09660-9

Chicca, J., & Chunta, K. (2020). Engaging students with visual stories: Using infographics in nursing education. *Teaching and Learning in Nursing*, *15*(1), 32-36. https://doi.org/10.1016/j.teln.2019.09.003

Dalen, N. E. (2021). *The effectiveness of persuasion via infographics*. Bachelor's Thesis. https://purl.utwente.nl/essays/88084

Desautel, D. (2009). Becoming a thinking thinker: Metacognition, self-reflection, and classroom practice. *Teachers College Record*, *111*(8), 1997-2020. https://doi.org/10.1177/016146810911100803

DeVoss, D. N., & Eidman-Aadahl, E. (2010). *Because digital writing matters: Improving student writing in online and multimedia environments*. John Wiley & Sons. http://ndl.ethernet.edu.et/bitstream/123456789/17488/1/22.pdf.pdf

Dodd, R. (2021). Psychological Wellbeing and Academic Experience of University Students in Australia During COVID-19. *International Journal of Environmental Research and Public Health*, 18(3), 866. https://doi.org/10.3390/ijerph18030866

Driscoll, D. L., & Wells, J. (2012). Beyond Knowledge and Skills: Writing Transfer and the Role of Student Dispositions. In *Composition Forum* (Vol. 26). Association of Teachers of Advanced Composition. https://files.eric.ed.gov/fulltext/EJ985815.pdf

Eri, R., Gudimetla, P., Star, S., Rowlands, J., Girgla, A., To, L., Li, F., Sochea, N., & Bindal, U. (2021). Digital resilience in higher education in response to COVID-19 pandemic: Student Perceptions from Asia and Australia. Journal of University Teaching & Learning Practice, 18(5). https://doi.org/10.53761/1.18.5.7

Fiscus, J. M. (2017). Genre, Reflection, and Multimodality: Capturing Uptake in the Making. In *Composition Forum* (Vol. 37). Association of Teachers of Advanced Composition. https://files.eric.ed.gov/fulltext/EJ1162165.pdf

Gallagher, E. S., O'Dulain, M., O'Mahony, N., Kehoe, C., McCarthy, F., & Morgan, G. (2017). Instructor-provided summary infographics to support online learning. *Educational Media International*, *54*(2), 129-147. https://doi.org/10.1080/09523987.2017.1362795

Gebre, E. H., & Polman, J. L. (2016). Developing young adults' representational competence through infographic-based science news reporting. *International Journal of Science Education*, *38*(18), 2667-2687. https://doi.org/10.1080/09500693.2016.1258129

Hadiyanto, H., Failasofah, F., Armiwati, A., Abrar, M., & Thabran, Y. (2021). Students' Practices of 21st Century Skills between Conventional learning and Blended Learning. *Journal of University Teaching & Learning Practice*, 18(3). https://ro.uow.edu.au/jutlp/vol18/iss3/07

Hafner, C. A. (2015). Remix culture and English language teaching: The expression of learner voice in digital multimodal compositions. *Tesol Quarterly*, *49*(3), 486-509. https://doi.org/10.1002/tesq.238

Hamaguchi, R., Nematollahi, S., & Minter, D. J. (2020). Picture of a pandemic: visual aids in the COVID-19 crisis. *Journal of Public Health*, *42*(3), 483-485. https://doi.org/10.1093/pubmed/fdaa080

Hews, R., McNamara, J., & Nay, Z. (2022). Prioritising lifeload over learning load: Understanding post-pandemic student engagement. *Journal of University Teaching & Learning Practice, 19*(2), 128-146. https://doi.org/10.53761/1.19.2.99

Jacob, R. (2020). Visualising global pandemic: a content analysis of infographics on COVID-19. *Journal of Content, Community and Communication*, *11*, 116-123. https://tinyurl.com/yvyjy6kd

Knobel, M., & Lankshear, C. (2008). Remix: The art and craft of endless hybridization. *Journal of adolescent & adult literacy*, *52*(1), 22-33. https://doi.org/10.1598/JAAL.52.1.3

Krishnan, J., Maamuujav, U., & Collins, P. (2020). Multiple utilities of infographics in undergraduate students' process-based writing. *Writing and Pedagogy*, *12*(2-3), 369-394. https://doi.org/10.1558/wap.18814

Lavelle, E. (2009). Writing through college: Self-efficacy and instruction. *The Sage handbook of writing development*, 415-423. https://tinyurl.com/m5ys3pv5

Lin, X. (2001). Designing metacognitive activities. *Educational technology research and development*, *49*(2), 23-40. https://doi.org/10.1007/BF02504926

Lohani, S. (2019). The history of multimodal composition, its implementation, and challenges. *The Criterion: An International Journal in English*, *10*(1), 118-130. https://www.the-criterion.com/V10/n1/LL01.pdf

Lyra, K. T., Isotani, S., Reis, R. C., Marques, L. B., Pedro, L. Z., Jaques, P. A., & Bitencourt, I. I. (2016). Infographics or graphics+ text: Which material is best for robust learning? *16th international conference on advanced learning technologies (icalt)* (pp. 366-370). IEEE. doi: 10.1109/ICALT.2016.83

Margolis, H., & McCabe, P. P. (2006). Improving self-efficacy and motivation: What to do, what to say. *Intervention in school and clinic*, *41*(4), 218-227. https://doi.org/10.1177/10534512060410040401

Martin, N. M., & Lambert, C. S. (2015). Differentiating Digital Writing Instruction: THE INTERSECTION OF TECHNOLOGY, WRITING INSTRUCTION, AND DIGITAL GENRE

KNOWLEDGE. *Journal of Adolescent & Adult Literacy*, *59*(2), 217–227. http://www.jstor.org/stable/44011242

McEntee, P. (2019). Every Picture Tells a Story: Using Infographics for Discussion Preparation. *New Directions in Teaching and Learning English Discussion. (*Vol.7). https://tinyurl.com/9urwsurm

Morse, M. L. (2021). "Increase Engaged Student Learning Using Google Docs as a Discussion Platform." *Teaching & Learning Inquiry 9* no. 2. http://dx.doi.org/10.20343/teachlearninqu.9.2.20

Reilly, P. (2020). Developing our students' level of mindfulness during these unprecedented times. Journal of University Teaching & Learning Practice, 17(5). https://doi.org/EJ650641

Robertson, L., Taczak, K., & Yancey, K. B. (2012). Notes toward a Theory of Prior Knowledge and Its Role in College Composers' Transfer of Knowledge and Practice. In *Composition Forum* (Vol. 26). Association of Teachers of Advanced Composition. https://files.eric.ed.gov/fulltext/EJ985812.pdf

Saldana, J. (2013). The coding manual for qualitative researchers. Los Angelos SAGE. In *:*. Beltz Verlag. http://digital.casalini.it/9781529755992

Şentürk, B. (2021). Writing in the Digital Age: Teaching Writing to Digital Natives. In E. Hancı-Azizoglu, & N. Kavaklı (Eds.), *Futuristic and Linguistic Perspectives on Teaching Writing to Second Language Students* (pp. 102-117). IGI Global. https://doi.org/10.4018/978-1-7998-6508-7.ch007

Shanks, J. D., Izumi, B., Sun, C., Martin, A., & Byker Shanks, C. (2017). Teaching undergraduate students to visualize and communicate public health data with infographics. *Frontiers in public health*, *5*, 315. https://doi.org/10.3389/fpubh.2017.003

Schunk, D. H., & Zimmerman, B. J. (2007). Influencing children's self-efficacy and self-regulation of reading and writing through modeling. *Reading & writing quarterly*, *23*(1), 7-25. https://doi.org/10.1080/10573560600837578

Shin, M. H. (2018). Effects of Project-Based Learning on Students' Motivation and Self-Efficacy. *English Teaching*, *73*(1), 95-114. https://files.eric.ed.gov/fulltext/EJ1312282.pdf

Smiciklas, M. (2012). *The power of infographics: Using pictures to communicate and connect with your audiences*. Que Publishing. https://tinyurl.com/2s4ynbh6

Smothers, E. C. (2021). Writing as Designing: Integrating Infographics. *The Journal of Multimodal Rhetorics*, 5(2), 129-146. http://journalofmultimodalrhetorics.com/5-2-issue-smothers

Stedman, K. D. (2012). Remix literacy and fan compositions. *Computers and Composition*, *29*(2), 107-123. https://doi.org/10.1016/j.compcom.2012.02.002

Stolarek, E. A. (1994). Prose modeling and metacognition: The effect of modeling on developing a metacognitive stance toward writing. *Research in the Teaching of English*, 154-174. https://www.jstor.org/stable/40171331

Sumer, M., Douglas, T., & Sim, K. (2021). Academic development through a pandemic crisis: Lessons learnt from three cases incorporating technical, pedagogical and social support. Journal of University Teaching & Learning Practice, 18(5). https://doi.org/10.53761/1.18.5.1

Taspolat, A., Kaya, O. S., Sapanca, H. F., Beheshti, M., Ozdamli, F. (2017). An investigation toward advantages, design principles and steps of infographics in education. *Il Ponte*, *73*(7), 157-166. https://tinyurl.com/bdaute2w

Toth, C. (2013). Revisiting a genre: Teaching infographics in business and professional communication courses. *Business Communication Quarterly*, *76*(4), 446-457. https://doi.org/10.1177/1080569913506253

Vázquez-Cano, E., Mengual-Andrés, S., & López-Meneses, E. (2021). Chatbot to improve learning punctuation in Spanish and to enhance open and flexible learning environments. *International Journal of Educational Technology in Higher Education*, *18*(1), 1-20. https://doi.org/10.1186/s41239-021-00269-8

Villarroel, V., Benavente, M., Chuecas, M., & Bruna, D. (2020). Experiential learning in higher education. A student-centered teaching method that improves perceived learning. *Journal of University Teaching & Learning Practice*, 17(5). https://ro.uow.edu.au/jutlp/vol17/iss5/8

Winchester-Seeto, T., & Piggott, L. (2020). ''Workplace' or Workforce: What Are We Preparing Students For?. Journal of University Teaching & Learning Practice, 17(4). https://ro.uow.edu.au/jutlp/vol17/iss4/11

Yarbrough, J. R. (2019). Infographics: in support of online visual learning. *Academy of Educational Leadership Journal*, *23*(2), 1-15. https://tinyurl.com/ynxwa99c

Yecora-Santos, A. I. (2022). The significance of Linguistic Relativity in COVID-19. Master Thesis. http://hdl.handle.net/10230/52284

Yildirim, S. (2016). Infographics for educational purposes: Their structure, properties and reader approaches. *Turkish Online Journal of Educational Technology-TOJET*, *15*(3), 98-110. https://files.eric.ed.gov/fulltext/EJ1106376.pdf

Yu, E. (2014). Let Developmental Students Shine: Digital Writing. *Research and Teaching in Developmental Education*, *30*(2), 99–110. https://www.jstor.org/stable/90011850