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From Antagonist to Protagonist: Shifting the Stories to Support Gen Z Students

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Abstract: This article explores prevalent stories about “Gen Z” students that unintentionally undercut both their success and learner-centered pedagogies. The authors consider how those beliefs might be reframed to serve all learners more effectively. We also explore how the racial reckoning, health pandemics, social unrest, and additional compounded traumatic events of 2020 complicated stereotypes about college-aged youth and magnified the ever-present need for more inclusive, flexible, and compassionate teaching approaches. We now have an opportunity to build on the lessons of 2020 and expand the lenses through which we consider our students’ visible behaviors and invisible experiences. We offer a rationale for and concrete pathways toward crafting more empathetic and productive stories about Gen Z students, which in turn allow us to develop teaching and assessment strategies that better align with our student-centered missions.

Keywords: Gen Z, narratives, equity, compassion, pedagogy, assessment

Disrupting the Stereotypes

The points disgruntled instructors make about some of the problematic Gen Z attitudes and behaviors are not necessarily false, but they fail to capture the full picture. As Chimamanda Adichie (2009) points out in her much-viewed TED Talk The Danger of a Single Story, we all are composed of multiple stories:

All of these stories make me who I am. But to insist on only these negative stories is to flatten my experience and to overlook the many other stories that formed me. The single
story creates stereotypes, and the problem with stereotypes is not that they are untrue, but that they are incomplete. They make one story become the only story.

So, too, when we tell only a single (negative) story about Gen Z, we have an incomplete picture of our students, which means we struggle to develop the empathy (Bayers & Camfield, 2018) and authentic relationships that lead to deep learning (Schwartz, 2019; Felton & Lambert, 2020). Gen Z is not monolithic, and a deeper dive into the attributes of this group reveals occasional contradictions as well as opportunities to re-design curriculum to better support today’s college students. After unpacking many of the stereotypes attributed to Gen Z, we will then turn to an exploration of how to leverage their assets to support growth.

Of Privilege and Passivity

Despite accusations of helicopter parenting causing a rise in student entitlement (Allen, 2019), nuanced Gen Z stories were called into question as COVID-19 and social unrest spread across the US in 2020. Higher education’s abrupt shift to remote teaching and learning shone a light on and magnified profound educational inequities. The pandemic and racial reckoning brought systemic injustices, including police brutality against unarmed black people and unequal access to medical care, to the fore. Meanwhile, amid great uncertainty, compounded trauma, and any number of barriers, many of our students have shown up to learn. They have also helped create political change. In person and on social media, they turned out in record numbers to protest systemic racism and police violence against black Americans, and then to vote: one study estimates that 52% of protestors at Black Lives Matters demonstrations in the early months of the pandemic were between the ages of 18-29 (Kaiser Family Foundation, 2020), while an estimated 52-55% of eligible voters under age thirty cast ballots in the 2020 election (Tufts CIRCLE, 2020). Our Gen Z students are not all retreating into privileged and protected pockets; not unlike young idealists from past counter-cultural movements, they are an activist and connected generation.

Gen Z is also more racially and ethnically diverse than previous generations and is pursuing higher-education at greater rates (Parker & Igielnik, 2020). At many institutions generally, and Camfield’s in particular, students are increasingly anything-but entitled and privileged. Often dubbed “the university of the future,” -- where more than 80% of students are members of historically underrepresented groups, 60% are Pell eligible, and 75% are the first in their families to attend college -- the University of California at Merced has received national recognitions: # 1 among public universities in outperforming expected graduation rates and # 5 among all universities in social mobility (UC Merced “Accolades,” 2021). This has not been achieved by insisting students assimilate and conform to our visions of the ‘typical’ college student. Instead, UC Merced has become a “student-ready college” by making room for those learners who have had to work two jobs and support family obligations, as well as study. These students have no family helicoptering around, monitoring their success. Often it is quite the opposite: establishing boundaries with family and needing to defend time spent studying takes up cognitive and emotional bandwidth for many students.

Further, their demographics have brought them added challenges. Hammond (2015) describes how “underserved English learners, poor students, and students of color routinely receive less instruction in higher order skills development than other students...as a result a disproportionate number of culturally and linguistically diverse students are dependent learners” (p. 12-13). This means they have come to rely on their teachers to define and pre-determine their learning, often through worksheets that call on the most basic of rote memorization or comprehension. When students arrive in college, many professors expect them to be self-regulating, independent learners. This disconnect between past schooling and college expectations creates an added academic burden for students.
already managing a whole host of other issues. To overcome this and foster learning independence, instructors may try to design opportunities for students to engage with “productive struggle that actually grows our brainpower” (p. 12-13). Unfortunately, such struggle can also be overwhelming for some students, especially when accompanied by an “amygdala hijack” (p. 40) brought on by threats such as imposter syndrome or stereotype threat. Therefore, as Verschelden (2017) states, we may need to spend more time helping our students manage these cognitive loads, rather than dismissing their inattention or late assignments as the byproducts of entitlement and privilege. How should we design all courses to foster this growth and allow for these demands?

Of Snowflakes

Gannon (2020) eloquently challenges the accusation that Gen-Z-ers are ‘snowflakes’—fragile and overly-sensitive—, calling “the argument that today’s students are somehow less capable of dealing with controversial ideas or being intellectually challenged... fundamentally disingenuous” (p. 126). He further elaborates a compelling counter-narrative:

Far from being a generation of entitled snowflakes, today’s college students are under siege. They have less funding, less support, learn in more dysfunctional institutions, and live in an environment that is more fractured and polarized than ever. They work more hours at more jobs than any previous generation of students, deal with more issues related to anxiety and mental health than any of their forebears, and face a postgraduate economy so bleak that the Baby Boom generation is in full-on denial of its very existence. All this, and they are mocked, by generations that had it twice as good, about how it’s all their fault (p. 126).

Unfortunately, this economic uncertainty is compounded by capitalist pressure for a college education to reap primarily monetary rewards (Tretina, 2021), which threatens to reduce educational interactions to the transactional. How, then, might we create a college curriculum that acknowledges future uncertainty, builds tolerance for ambiguity, and emphasizes transformation over transaction?

Of Electronics Addiction

Despite compelling research on social media addition, sometimes called IDisorder (Mitus, 2021), disrupting the myth of the distracted, social-media-saturated Gen Z-er necessitates unpacking a couple of biases and blindspots. The first is the fundamental attribution error instructors may engage in where an interior monologue might sound like this: “When I check my e-mail during a Zoom meeting, I am being efficient with my time and am paying enough attention to the meeting to get the gist of it. Whereas when my students chat over Discord during my class, they are disrespectful and miss out on important elements of my lesson.” Recognizing ways attention works for all humans can help rectify this fallacy. College instructors may also carry outdated knowledge about today’s internet users. For example, observations about “Facebook depression” (O’Keefe, Clarke-Pearson & CCM, 2011) are over a decade old. To think today’s teens are as vulnerable to those effects might be inaccurate, especially when even at that time the conclusions were disputed with counterclaims that social media actually be useful in combating stigma surrounding mental illness (Moreno et al, 2011).

Secondly, we might need to look at how our students are engaging with the internet and social media, not just noting that they are doing so. For example, our students are far more likely to verify the factual basis for a claim or pursue a topic of idle curiosity using a quick internet search than previous generations were who had to rely on the library-housed, multi-volume Encyclopedia Britannica.
We can expect that some students may use Google superficially or trust on-line sources too implicitly. It is our job as educators to teach critical digital literacy, not to assume they come to college with it already intact.

We might also note that concerns over potential social problems caused by the pursuits of youth started long before electronic entertainment came around (Best, 1998). Moreover, Gen Z itself appears to be somewhat divided on the impact of social media on their lives. In a recent Pew survey (Parker & Igielnik, 2020), roughly one-third says the effect is mostly positive, about one-quarter say it has been mostly negative, and just under half say it has been neutral. Those who see it positively tend to say it helps them feel connected with friends and family, whereas those who say the effect is negative worry about bullying and rumor spreading. This, again, illustrates the danger of perceiving Gen Z as monolithic and incapable of awareness and self-analysis.

Moreover, the 20-year span Gen Z has been around has also witnessed a re-evolution in the use of the internet as a base for creative pursuits. Far from passive users, today’s college students are making art, composing new music, performing original poetry, and hosting podcasts at never-before-seen rates. A survey (Rapp, 2019) of over 1,200 Gen Z-ers revealed more than half engaged in creative pursuits through platforms like YouTube, Snapchat, and TikTok; however, this did not mean that their off-line lives lacked artistic engagement: 77% of the respondents reported that they spend their free time offline drawing, journaling, or playing an instrument. This has also translated into an interest in homemade crafts and do-it-yourself interior design tips, which are often freely shared on-line. How can we harness the potential of media engagement while also fostering digital self-regulation, civility, and information literacy?

**Of Cancel Culture and Conformity**

Despite legitimate concerns over cancel culture, “an intolerance of opposing views, a vogue for public shaming and ostracism, and the tendency to dissolve complex policy issues in a blinding moral certainty” (Letter on Justice and Open Debate, 2020), Gen Z also exhibits a great deal of creativity and acceptance of ambiguity. Far from the merely superficial or decorative, Gen Z creativity leverages the wealth of information available on the internet to ‘crowd source’ and to perfect the ‘mash-up,’ a “melting of borders, both aesthetic and cultural” (Rapp, 2019). Additionally, they report that while such borrowing, mixing, and complication allows for greater expression, it also tends to be grounded in an individual’s personal truth. Increasingly, this truth is built around:

social causes like LGBTQ issues, body positivity, and mental health… The internet can be a judgmental place, but Gen Zers are unabashedly using their reach to create communities and dialogue around their fluidity. They’re redefining gender identities and breaking beauty norms, going beyond tutorials and selfies to establish more multifaceted personas (p. 67).

If our students are making videos to promote sustainability and/or body positivity, how might we leverage some of what is happening organically in our students’ spare time and harness that creativity in our classrooms?

Gen Z-ers also seem more comfortable with ambiguity, prefer to blur boundaries, and embrace change (Parker & Igielnik, 2020). For example, many do not identify with a political party but rather support specific causes and engage in grassroots efforts to promote them. They are more apt to self-monitor, suspend judgement, and stand-up. According to a study published by the Annie E. Casey Foundation (AECF, 2021), Gen Z members tend to be more open-minded, liberal-leaning and actively engaged in advocating for the fair and equal treatment of others. Their strong presence
at protests and the election polls in 2020 demonstrated this propensity. True, this tendency can sometimes be taken to a “cancel culture” extreme, but it also signals an unwillingness to passively accept the status quo – what in our nation’s founders was praised as a heroic revolutionary spirit. It also points to an educational opportunity: how can we work with our students to identify effective ways of challenging authority/dominant norms/objectionable behavior and stimulating discourse?

Revealing and Re-Prioritizing Hidden Narratives

Along with the incomplete narratives discussed previously, an insistence on the most unflattering and negative interpretations of student behaviors risks ‘blaming the victim,’ masks more nuanced realities, and impedes more complex understanding of our students’ experiences. Even if we accept the “tethered (to electronic devices) and privileged” Gen Z labels, we may miss out on two others. As discussed by Camfield, Moore, & Allen (2020), Gen Z students also labor under the ‘pressure to be perfect,’ to perform for the approval of parents, coaches, teachers, and peers. This claim is borne out by studies that show a linear increase in perfectionism for Gen Z when compared to previous generations of college students (Curran & Hill, 2017). They also feel profoundly ‘unsafe’ from school shootings, to uncertain economic forecasts, not to mention global pandemics; it is no surprise we are seeing epidemic levels of depression and anxiety (Twenge, 2018), arguably not entirely due to dependence on their digital devices.

Sadly, many of the stereotypes in circulation about Gen Z have at root the same impact on students: each undermine resilience by either removing any adversity from students’ paths or by creating unbearable burdens. Neither allows students to develop learning muscles necessary for perseverant engagement with tough issues. Camfield, Moore, and Allen (2020) asked: how might we reframe our conceptualization of ‘rigor’ to create just the right amount of difficulty so that students develop the skills to ‘bounce back’ in the face of academic challenge? It also suggested that such a reconceptualization requires “critical empathy” from instructors where we reconsider “our perception of what students ‘should’ be retaining from certain lessons, providing us with the opportunity to revisit lessons, revise our curriculum for effectiveness, and model a mode of continuous learning that brings collaborative discovery back to our classrooms” (p. 130). Now we add to that story.

As co-authors, in our teaching and in presenting on our past research, we have had the opportunity to talk with many Gen Z students. Not only have they expressed appreciation for our capacity to see the fullness and complexity of their identities, but they have also added to our insights. One point often made is that, perhaps because of the constant self-comparison encouraged through social media or because of being told they are ‘privileged and entitled,’ some students do not feel they have the right to own their own stories. As one young woman put it, “I keep seeing these stories about people starving in the Third World and about others being forced into sex trafficking. Somehow that makes my own problems with managing my schedule seem trivial.” On one hand, such a statement might be lauded as valuable perspective-taking; on the other hand, minimizing our own experiences is an unproductive form of self-gaslighting. How might we help our students contextualize their knowledge and feelings, balancing what they learn about the experiences of others with their own?

Disrupt Inherited Pedagogical Narratives

Unfortunately, instead of enhancing our students’ positive identities, many of our inherited pedagogical practices are shaped by motifs of subjugation and radical individualism. More specifically, our campuses are still fundamentally unwelcoming to women and students of color. This is not surprising as academic institutions in this country are rooted in white-centered and patriarchal structures (Hill et al. 2020). The norms of hierarchy (e.g., uncritically deferring to the sage on the stage)
and expectations about productivity and professionalism (e.g., that academic work is separable from one’s personal obligations and unaffected by emotions) that we often replicate in our classrooms reinforce this oppression. Additionally, inherited instructional and assessment practices that are teacher-centric, that promote competition among students, and that use punishment as incentive recast and maintain persistent patterns of domination and marginalization. We have seen this recently as institutions have addressed concerns about student cheating in remote environments by doubling-down on surveillance technology, which tells students that they are not to be trusted, further undermines their self-efficacy and resilience, and maintains a dependency model of education. Myths about alternative approaches being less “rigorous” (perhaps code for less white and male) impede change. Finally, over-applications of the work of scholars like Carol Dweck (2007) and Angela Duckworth (2018) can do the same: while the frameworks of growth mindset and grit can potentiate self-efficacy and learning, neither mindset nor grit alone can overcome systemic oppression, or a fundamental lack of access to resources and opportunity. No amount of resilience can make up for historical educational inequities, not to mention immediate barriers to learning like no access to the internet, an empty gas tank, or too little money for textbooks.

Embrace Relational Narratives

Another motif that has emerged in our recent work is the hunger of Gen Z for meaningful relationships. Some have expressed this as feeling like they “have to ‘curate’ their lives on social media and ‘watch their every word’ for fear of ‘cancel culture.’” However, others simply say they want to connect with other people in “real” and “deep” ways. Here, Twenge’s (2018) work and her observation that “iGen’ers spend less time interacting with their peers face-to-face than any previous generation” (p. 71) and her conclusions about a rise in loneliness resonates. However, she attributes this almost exclusively to internet use, not perhaps to overscheduling or other conflicting demands on time. A different picture of reality, as revealed by the recent pandemic and the shift to emergency remote instruction, is that students crave face-to-face connection with each other. For example, in the UC Merced New Student Survey from fall 2020, despite the fact that 60% of the 1,019 first-year students completing the survey said they had a strong sense of belonging to the campus community, 54% identified “missing connection with family or friends,” with 60% also noting “difficulty making new friends,” as barriers to their schoolwork or academic success (UC Merced IRDS, 2021). Campuses can help students build more meaningful connections if they prioritize relationship-building through activities like collaborative learning and team science.

We also know relationships with instructors matter as well. Camfield’s 2016 study of developmental writing and writers proposed the theory of mediated-efficacy which described the role of a teacher as that of an intermediary that helps students “reconcile negative self-beliefs developed in the past with newly-forged positive identities that could impact their future performance” (p. 9). It acknowledges instructor power and suggests we use this as a force for good, to help “students dismantle learned helplessness, dispute pessimism, and develop optimism” (p. 10). In this context:

specific course content or skills become the tools of that mediation. Useful yes, but not unlike the utility of knowing how to use a hammer, only truly valuable when used to build something. Mediated-efficacy requires a balance between helping students wield tools on their own and creating the environment in which they believe they have something worthwhile to construct (p. 10).

Felton and Lambert (2020) describe relationships as the “beating heart of the undergraduate experience” (p. 1), and while they vaunt their importance, they simultaneously caution that “they
should not occur by happenstance or only for some students” (p. 1). Their robust study, involving 400 interviews with students, faculty and staff at 29 higher-education institutions across the country, lead them to conclude “the future is relationship-rich” (p. 147). Relationships can be transformative, positively shaping student self-esteem, sense of meaning, and world view.

Changing the Narratives

Harkening back to the previously-cited TED Talk, Adichie (2009) notes that “Stories matter. Many stories matter. Stories have been used to dispossess and to malign, but stories can also be used to empower and to humanize. Stories can break the dignity of a people, but stories can also repair that broken dignity.” Figuring out strategies to humanize our perceptions of Gen Z students is imperative. To do so we must build our curriculum and develop our pedagogical practice around narratives that help students manage cognitive load, utilize their abundant creativity, promote tolerance for ambiguity, experience academic rigor that builds resilience, activate critical empathy, own their own stories, and build relationships.

While no one would have asked for these circumstances, the events of 2020 did create greater potential for higher education to think outside of the box, or even to re-examine why that ‘box’ exists – where did it come from? Who is being asked to perform contortions to fit into it? As educators had to abruptly shift to teaching remotely amid compounded traumatic events and further visibility of systemic injustice, we witnessed an expansion of empathy and creativity: instructors tirelessly led with care to stay connected with students and sustain learning. Many radically reimagined teaching and assessment strategies to support students as everyone in the classroom navigated distress and uncertainty. We now have an opportunity to build on the lessons of 2020 and expand the lenses through which we consider our students’ visible behaviors and invisible experiences.

Shifting Perspective or Point-of-view

We can start by shifting our perspective or points-of-view as instructors. How we imagine our students, even before meeting them, matters. If we picture Gen Z students as a monolithic group of privileged, protected, and distracted young adults, we will be more apt to misjudge and misinterpret their actions. If we replace that story with one of a remarkably diverse, creative, engaged, and connected generation, we will be more open to seeing the deeper dimensions of their work and behaviors, as well as identifying our own blindspots in perspective. Once we are in the classroom together, we can assume the best of our students and interpret their actions with empathy (Bayers & Camfield, 2018).

At workshops, we often engage faculty in an exercise designed to reveal how quickly instructors can leap to negative judgments on the basis of incomplete information. We invite participants to write down a common behavior they see manifest in their Gen Z college students, cite a stereotypical explanation of that behavior, then imagine a more generous interpretation of what might be going on for the student under the surface. To cite one example, “students don’t do the reading” often comes up as a common problem. Initial and oversimplified interpretations might point to learner laziness, disinterest, or attention deficits, among other possibilities, as the cause. However, instead of judging or blaming the student, a deeper consideration can reveal a lack of instructor transparency around why and exactly how to approach a reading assignment or can uncover a lack of alignment between readings and course goals or in-class activities. Such insights lead to productive pedagogical interventions. To the extent being unprepared for class is the student’s fault, replacing the dismissive assumption of laziness with a more generous interpretation -- lack of access to the reading material, or competing demands (other classes, work, and family, for example) -- activates trust and
builds relationships. If we can compassionately imagine the barriers to our Gen Z students’ learning, we can design better pathways to success.

Alongside instructor empathy and compassion for Gen Z student needs must be an active commitment to fostering hope in those students who may feel overwhelmed or jaded. Equity-minded educators should not minimize those things many of our Gen Z students experience and oppose: oppression and social injustice. An ever-increasing number of our students live these realities. So, we agree with Hammond (2015) that “instead [of amplifying a sense of victimization], we should focus on highlighting a community’s resiliency and vision for social change” (p. 92).

Redesigning the Setting

Begin with cultural frameworks. Given that higher education was historically written by and to further empower white men, a substantial portion of our Gen Z students do not see themselves or feel safe and supported within traditional academic narratives, even if they are unaware of the source of this unease (and may unfairly blame themselves for their own discomfort). Creating welcoming and affirming spaces for all of our students will require educators to question not only the foundations of knowledge and standard practice in each and every one of our fields, but also our own explicit and implicit biases. We need to rewrite our teaching stories to include our current students as central figures and become vigilant in interrogating if and how our instructional assumptions, policies, practices, and content draw from, affirm, and speak to the various identities and cultural frameworks our students hold. As we elaborate below, strategies like anti-racist pedagogy, universal design for learning, and other approaches grounded in collaborative learning and transparent teaching support this rewrite.

Antiracist pedagogy requires that we work to see, make visible, and actively counter the ways in which our academic practices and curricula are built upon primarily Eurocentric voices and views; this includes interrogating disciplinary foundations that have come to be seen as inherent and devoid of a particular cultural perspective (Blakeney, 2011). In the classroom, antiracist pedagogy requires us to question not just what we teach, but also how we do so (we explore equitable, power-sharing practices below). Those among us who hold white privilege must commit to the lifelong work of antiracism on personal levels in order to engage it systematically in our pedagogy. In Me and White Supremacy, Layla F. Saad (2020) expresses the societal impact that this inner work can have: “since systems and institutions are created and held in place by many individual people, it is my hope that as more people do the personal inner work here, there will be a ripple effect of actionable change of how white supremacy is upheld out there” (p. 12). “Out there” includes in our classrooms, offices, and every other aspect of campus culture. As we expand our own knowledge and resiliency for engaging in uncomfortable yet necessary conversations about race and power, we can model for and better support our Gen Z students in doing the same. Such conversations necessitate careful course and classroom architecture.

Alongside establishing cultural frameworks, build enhanced access. The mindset fostered by Universal Design for Learning (UDL) can also help us better imagine, prepare for, and support our highly diverse Gen Z students. UDL acknowledges that all learners come to our classes with varying strategies for and barriers to learning—differences that may or may not be visible—and prompts us to build in flexibility as a design and operating principle. Such adaptability can help us better serve not only the estimated 20% of Gen Z students with learning disabilities (NCES, 2019), but also those from diverse linguistic, cultural, and academic backgrounds, those juggling competing demands in their lives, and others marginalized by traditional academic structures and practices. UDL guidelines, outlined by CAST (2018), encourage instructors to provide multiple means of: 1) engagement, or ways of stimulating learner interest and motivation; 2) representation, or ways of presenting information
and content; and, 3) action and expression, or ways of allowing learners to demonstrate what they know. We encourage colleagues to consider their go-to course design, instructional, and assessment approaches and, in each case, ask: “Who is best served by this approach? Who might be excluded by it? What barriers to learning might I unintentionally be creating with this approach? What additional options might I build-in to account for learner variability?” For example, if my assessment is only based on written work, students with dysgraphia or dyslexia will struggle to demonstrate what they have learned. Providing alternative ways for students to demonstrate their learning (e.g., through voice recordings), aligned with the same learning outcomes, will offer more equitable access. If my go-to instructional practice is small-group work, introverts may struggle to participate. Assigning specific roles or tasks within those groups and balancing team-based learning with independent work makes space for all students to engage. In addition to empowering all students with more pathways to, though, and beyond the achievement of course learning outcomes, the flexible mindset fostered by UDL can help us better adapt as we continue to navigate the impact of the global pandemic and further disruptions to teaching and learning.

All students thrive in a welcoming and collaborative classroom environment. Learning invitations and gestures that “summon students cordially” into our learning spaces (Purkey, 1992) should ground our courses. Yet as Bali et al. (2018) note, it is not enough to “assume that saying ‘welcome’ will mean people feel welcome;” rather, we need to craft and support “intentionally equitable hospitality.” Before our classes begin, we can set the tone for engagement through an asynchronous opportunity to interact, such as quick video introductions or short narratives that allow them to begin telling their stories and making connections. This will lay the foundation to grow and sustain community during the semester. Equity Unbound (n.d.) has curated a rich collection of structured synchronous and asynchronous activities, each with detailed instructions, for building and sustaining “intentionally equitable hospitality.” Far from being mere “ice breakers,” activities that allow us to get to know our Gen Z students and that create multiple and meaningful opportunities for them to interact with one another will allow us to not only connect our course content to their interests and aspirations, but also affirm their identities. To reframe our own stories about Gen Z students, we need to hear theirs. Something as simple as a daily check-in helps students feel seen and valued and can create ripple effects, such as more robust participation in instructors’ office hours.

Inviting students to help shape discourse agreements also sets the tone for community and collaboration while affirming existing Gen Z values of advocating for the fair and equal treatment of others (AECF, 2019). When students become active agents in shaping the learning environment, they become more invested in and accountable to the class community (Brookfield & Preskill 2005). This could have an added benefit of disrupting a view of learning as individualistic and transactional. The syllabi that house these agreements, alongside additional expectations and roadmaps to course success, can also be characterized by welcoming, collaborative, and supportive language; for example, we can replace cold, dry, and punitive syllabi statements with invitations and strategies to learn, connect, and succeed. As an illustration, statements about university honor codes are often inherited from a boilerplate document that assumes the worst and offers little educational support:

Students must observe the University Honor Code. This professor strictly enforces this code and its stipulated penalties. If you have any questions about plagiarism and other departures from the right way of conducting yourself in academic situations, speak with me. Ignorance of policy is not an excuse to violate policy. (Camfield syllabus: 2013)

How different a more intentionally designed and educationally focused statement can sound:

**Plagiarism is an issue that is as complicated as linguistic expression is nuanced. For our**
purposes, plagiarism entails representing another’s work as your own. Note that plagiarism includes:

- submitting work that is done in part or wholly by someone else (or done by you for a different class/context)
- paraphrasing or summarizing any source without referencing it
- copying any source without using quotation marks or block indentation.

In sum, if you submit your own work with all outside sources or ideas carefully and correctly documented, you will have maintained academic honesty. Remember that writing is a thinking process, so you should engage with resources as though you were in a conversation. The integrity of your ideas rests on maintaining scholarly habits while in this dialogue with experts; ask questions and research actively with detailed notes. (Camfield syllabus: 2021)

In addition to sounding harsh, the first statement also exemplifies the hidden curriculum, which is a product of generational-privilege; it assumes student knowledge about “the right way” of conducting oneself in academic situations. Such exclusionary assumptions can add to students’ cognitive loads (Verschelden, 2017) and activate anxiety, whereas more transparent and inviting statements can ease and welcome.

Co-authoring the design of learning activities when possible—for example, by soliciting student input on content or assignments—can simultaneously support class community and learner autonomy by shifting traditional classroom roles from teacher- to learning-centered dynamics. Such activities need not be time-consuming and may result in better student understanding of expectations. For example, students can analyze an assignment prompt or exemplary model to identify salient components and steps necessary for successful completion to co-generate the rubric by which they will subsequently be evaluated. This can offer students’ a sense of both agency and connectedness. It can also counter the sense of helplessness and isolation fostered by the pandemic and recent social upheaval. A place to begin is with discussion of course outcomes: We can invite students to consider how the class aligns with their own learning, professional, and life goals. We can explore the “emergent outcomes” students discover as the course unfolds (Stommel 2017). When we provide these kinds of opportunities for students to weigh in on and take stock of how our teaching, class activities, and their approaches to learning support their values, we make space for them to better ‘own their own stories’ and see their education as a mechanism for fleshing out their autobiographies.

We can further empower Gen Z students by transparently sharing scripts for how to succeed in course activities, from class interactions to assignments and assessments. Transparent teaching has been demonstrated to boost academic confidence, motivation, learning strategies, skill transfer, and success for all students, and to be particularly supportive of students who are the first in their families to go to college and/or from groups historically excluded from college campuses (TILT Higher Ed). When we explicitly and straightforwardly clarify the purpose, task, and criteria for success in our assignment instructions, we decode the unspoken rules for how to succeed in academia. Helping our Gen Z students understand the meaning, merit, and relevance of coursework to their academic success and future careers can generate buy-in, while meaningful feedback can help them identify concrete ways to improve their performance and overall learning.

Transparent teaching provides a scaffolding that allows students to explore and own their identities as scholars, or become active authors of their learning stories. Hanstedt (2018) describes this negotiation as key to developing the skills to confront “wicked,” 21st-century problems:
Authority in this context implies authorship, the ability to write and rewrite, shape, and create. At the same time, this ability comes from something or someone. Authority is granted, given, and earned. The content and skills students acquire during their years in college are crucial; they are part of what creates a sense of authority in students (p. 5).

This process entails a shifting of traditional and transactional classroom roles and expectations. Our classes can give students spaces to practice assuming the kind of authority Hanstedt describes, sometimes getting it wrong, and trying again. To cite one example, identifying and even scripting roles in small group work can allow students to intentionally listen to and support one another, to try on different conversational gestures, to build their academic confidence, and to find their scholarly voices. Structured collaboration lays the groundwork for organic interaction, civil discourse, and creative problem solving. When students are clear on what the task is and know that everyone will not only be expected to but also have the opportunity to participate equitably, their anxiety is reduced, and they can engage more productively (Eddy & Hogan 2017; Kernahan 2019).

Transparency and structure, from scaffolding frameworks and roles for activities to clear and accessible roadmaps through our courses and assignments, can also provide a crucial sense of safety for students returning to campus following the traumatic events of 2020 and beyond. It has always been important to reduce cognitive load and keep our students’ focus on learning through clear course pathways. The extraordinary events our Gen Z students have witnessed and experienced in their recent lives--a global pandemic, repeated police brutality against black Americans, extreme political divisiveness, environmental catastrophes (hurricanes, wildfires, floods, and other disasters), a record number of mass shootings, and more--heighten the need for clarity and structure in our classrooms.

As we co-create this new narrative, instructors must also become more mindful of how we speak to and with students, as language can convey either power-over or power-with others. This does not mean a sacrifice of rigor. Hammond (2014) describes how teachers as “warm demanders” (p. 97) find the right balance between a firm insistence on academic standards and a nurturance that allows students to feel safe to approach with questions. Engaging in conversations that communicate our support as well as provide an entrée into academia can also activate student creativity. If we are open to hearing students’ suggestions, we can harness some of that Gen Z inventiveness. One recent example of this occurred during the shift to emergency remote instruction in spring 2020 in Camfield’s first-year seminar course intended to introduce students to life at a research university. As such, it had a required component that was originally assigned as a group-written research paper with an accompanying in-class oral presentation. The pandemic made this impossible, so Camfield asked her students for ideas on alternatives. One student suggested they each compose and record a research-based podcast to be uploaded to the course discussion board. Not only did these podcasts fulfill all of the learning outcomes of the traditional assignment, but the quality of the production was also far higher than the previous in-class presentations. Moreover, students expressed far more enjoyment and satisfaction with the assignment, as well as feelings of having gained relevant or ‘real world’ skills. Such a reimagined assignment points to the value of tapping into Gen Z creativity and devising new ways of assessing their learning.

While the previous example demonstrates the way we can change how we approach assessment to better support learning, another component of the dialogue we develop with students has to do with the language of our feedback. Camfield and Bayers (2019) describe traditional assessment protocols as “mindless,” in that they can be overly fixated on perceptions of objectivity and scientific validity and rely on isolated, summative, and high-stakes tests, making students feel dehumanized and disconnected from the learning process. We have called for more “dialectical evaluative practices that invite students into, guide students through, and take students beyond learning in the classroom in ways that honor their agency as whole persons” (p. 123). This can involve
figuring out ways, like student self-annotation, to access invisible learning (Camfield, Moore, & Allen, 2020) or substituting punitive reading quizzes, which reinforce dependent learning and instructor power, with more creative approaches, like the “one-pager,” where a reading response is built around a student-selected image that they feel typifies the dominant theme or take-away from the assigned reading. Subsequent class discussion can then be structured around the sharing of these images. Not only does this assessment approach encourage completion of assigned work through peer-based accountability, but it also fosters visual literacy and other 21st-century skills (Minor, 2021).

In addition to the examples previously shared, other forms of more mindful assessment might include: outcomes framed around integrated concepts; more emphasis on frequent, lower-stakes assessments (versus less frequent, high-stakes tests); asset- (instead of deficit-) based evaluation methodologies and rubrics; an emphasis on meaningful, targeted feedback over grades; self- and peer-assessment; and opportunities for post-assessment reflection and metacognition. Each of these approaches can counter the grade-driven, competitive culture our Gen Z students were raised in and help spark significant, creative, collaborative, and effortful learning that honors error and even discomfort as part of the process. The global pandemic prompted many instructors to experiment with these and other alternatives to traditional assessment practices. Our hope is that this rewriting of old assessment narratives continues to evolve as we move forward.

Conclusion

By inviting educators to shift their perspective on how they imagine their students (even before meeting them), to redesign the settings in their classroom, to help students craft scripts for success, to build dialogues with them that flatten hierarchy and foster learning relationships, we hope to revise the narrative of how we teach Gen Z students. With this new framing, students can better manage cognitive load, ambiguity, and the anxiety brought about by living in these complex times. We have also suggested ways to leverage Gen Z’s assets to help them develop the resilience to withstand whatever the future may bring. Yet in the end, much as we have attempted to disrupt some of the stereotypes and “repair broken dignity” (Adichie, 2009), we do not mean to imply we have told the whole story. Instead, we hope to encourage instructors to enter their classrooms more enthusiastic about their teaching, empathetic toward Gen Z, and inspired to ask: who are you? – with the reminder that a story does not tell itself and is highly influenced by how it is prompted.

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Why Faculty Underestimate Low-Income Students’ Family Responsibilities

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Abstract: Low-income college students face costly moral choices between pursuing their own academic success and fulfilling their family responsibilities. They almost certainly face these choices more frequently and at a greater personal cost than their faculty recognize. This article explores the sources and nature of that professorial lacuna; the article argues that this moral oversight results from the fact that middle-class people and low-income people often practice family in subtly but significantly different ways. They tend to emphasize different moral norms (independence vs. mutual aid) which shape the qualitative nature of college students’ obligations within their families. They also tend to utilize different family structures (nuclear vs. complex and extended) which create quantitative differences in the number of people to whom family responsibilities can attach. The paper ends with a practical implications section that discusses ways to address this lacuna so instructors can gain insight about their students’ familial obligations.

Keywords: class, family responsibilities, family structure, low-income college students

Introduction

Low-income college students face costly moral choices between pursuing their own academic success and fulfilling their family responsibilities (Morton, 2021). They almost certainly face these choices more frequently and at a greater personal cost than their faculty recognize. This article explores the sources and nature of that professorial lacuna, in the hopes that probing it will help us begin to ask better questions about our students’ moral situation. This article is also a reflection on my own teaching experience. Twenty-something-year-old students have often impressed and sometimes astounded me by their commitment to fulfilling family obligations, like heading home for a few weeks when a mother’s partner got violent or missing a day of class to save family keepsakes from a storage unit foreclosure. Of course, I noticed when these acute situations removed my students from the classroom. But what about all the other ongoing, subtler draws on their time, attention, and money: siblings who need childcare, parents who need emotional support, cousins who could use a little extra cash? I suspect these family responsibilities fly under most instructors’ radars, including mine, still.1

Faculty cannot begin crafting caring and just pedagogical responses to students’ often tragic trade-offs until we understand them better. More research is needed on that front. However, this

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1 Quotes from college students, aged 19-25 years old, at a first generation and low-income serving institution.
2 Recent scholarship indicates these subtler family responsibilities are both common and important, materially impacting low-income graduation rates. See Goldrick-Rab (2016) and Kinsley (2014).
article starts one step further back: what is it that prevents faculty from seeing and understanding their students’ family obligations in the first place? Why are our low-income students’ family responsibilities so difficult to fully appreciate? This paper offers the beginning of an explanation of why we don’t know what we don’t know.

In short: because of class.3 People from middle-class and low-income backgrounds often practice family in subtly but significantly different ways. These groups tend to emphasize different moral norms (independence vs. mutual aid) which shape the qualitative nature of college students’ obligations within their families. They also tend to utilize different family structures (nuclear vs. extended) which may create quantitative differences in the number of people to whom students’ family responsibilities can attach. Because faculty usually come from middle-class (and often upper-class) backgrounds, it would be unsurprising if they brought middle-class expectations of family norms and structures with them into the classroom (Nietzel, 2021; Nunlee, 2016).4 This article attempts to show how these expectations could lead faculty to radically underestimate the depth and breadth of family responsibilities low-income students perceive for themselves. This article ends by briefly discussing three strategies for bringing our expectations into alignment with our students’ own moral commitments to their families.

Moral Norms: Individual Autonomy vs. Mutual Aid

Young people growing up in middle-class and low-income families learn somewhat different lessons about who in their families is responsible to care for whom and how. For middle-class students, responsibility flows mostly downhill, from older to younger generations. Middle-class parents shield children from weighty family responsibilities throughout their early to mid-twenties, enabling a period of personal exploration and professional development known as “emerging adulthood” (Arnett, 2000). By contrast and often of necessity, low-income families tend to initiate their children into the work of caring for other family members’ material and emotional wellbeing at younger ages. The sections below explore the moral expectations reflected in these class-influenced parenting strategies.

Individual Autonomy

Middle-class parents believe that one of their principal responsibilities is to help their children become independent. Raising children who can take care of themselves and make decisions to secure their own well-being secures a family’s middle-class identity as much as it preserves the parents’ standard of living (Zaloom, 2019, p. 7).

3 Throughout this paper I use the term “middle-class” and “low-income” to describe different socio-economic groups. The terms are not ideal because they are asymmetrical. It would be preferable to use either “class” or “income” to describe both groups. Still, for two reasons I have chosen to use this mismatched terminology. First, it strikes me as disrespectful to refer to any group of people as low-class; that phrasing has a moral bite to it, a demeaning judgment about people’s ontological worth. That language threatens to undermine my ability to describe this group’s life situation respectfully. Also, I am not at all sure that most people with low incomes think of themselves as belonging to a shared cultural group that could be described accurately by the term “low-class.” By contrast, middle-class Americans often embrace that cultural identity as such (Nunlee, 2016). My use of the term “middle-class” captures this self-understanding, as well as the markers of income and educational attainment that characterize this group (Reeves, Guyot, and Krause, 2018).

In focusing on how class impacts faculty’s misperceptions of students’ family responsibilities, I do not mean to imply that class is the only or even the most important cause of misunderstanding. Gender, race, nationality of origin, and/or ethnicity likely also play important roles.

4 Faculty also tend to be white. Seventy five percent of them were in 2017 (“Race and ethnicity of college faculty”).
So argues Caitlin Zaloom in *Indebted: How Families Make College Work at Any Cost* (2019). Zaloom documents the lengths to which middle-class parents will go to provide their children with a college education: taking on student loan debt; deferring retirement investments; purchasing homes in neighborhoods they can barely afford in order to send their children to public K-12 schools where their children will receive adequate preparation for college. The reason middle-class families pay so dearly for their children’s college educations is that a 4-year degree is the *sine qua non* of financial security in the modern economy (at least, middle-class families believe that to be the case). A driving goal of middle-class parenting is securing their children’s long-term economic autonomy.

Educational decisions are not the only indicator of the middle-class’s commitment to intergenerational independence. One can also detect this norm by paying attention to the sources of worry and shame in middle-class family life. Many middle-class parents fret—even as they write tuition checks—that their inadequate retirement savings will render them “burdens” to their children in old age (Zaloom, 2019). Other middle-class individuals feel shame when adult children move back home for some period after college. Middle-class people often pathologize such housing decisions, treating them as “failure(s) to launch” rather than simply a matter of bad luck or a difficult housing market (Hamlett, 2018; Zaloom, 2019).

Middle-class families’ commitment to their children’s independence begins long before college application season. Almost from birth, middle-class families nurture their children’s ability to steer their own life courses. Parents teach children to make choices, practicing on minor decisions (would you like apple slices or fries with lunch?) so that children feel empowered to exercise choice in more important areas (which summer internship should I pursue?). Middle-class parents also train their children to negotiate with authority figures (ask the doctor any questions you want, tell the teacher how you learn best) so they know how to advocate for themselves within important institutions (Lareau, 2011). Annette Lareau’s classic text *Unequal Childhoods: Class, Race, and Family Life* describes the results of this parenting style:

> The White and Black middle-class children in this study…exhibited an *emergent sense of entitlement* characteristic of the middle class. They acted as though they had the right to pursue their individual preferences and to actively manage interactions in institutional settings. They appeared comfortable in these settings; they were open to sharing information and asking for attention. Although some children were more outgoing than others, it was common practice among middle-class children to shift interactions to suit *their* preferences. (2011, p. 6, italics original)

Middle-class families spend years “concertedly cultivating” (Lareau, 2011, p. 2) their children’s ability to look out for their own interests. Then parents invest tens of thousands of dollars (money they may or may not have) in college educations to give their children a shot at economic independence. No doubt most of these middle-class parents expect their young adult children not to squander these efforts through hard partying and general slackness. For the very same reasons, it would be odd if these middle-class parents expected their children to shoulder significant family responsibilities, if doing so threatened their dearly bought academic opportunities. The moral lesson middle-class children might reasonably take from this parenting style is that their first and highest responsibility is to chart a successful professional path and take care of themselves.

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5 This situation is not irony free. In promoting their children’s future financial independence, parents often make financial sacrifices that undermine their ability to remain financially independent of children in old age (Zaloom, 2019).
Mutual Aid

Low-income families often teach their children something quite different, that their responsibility is to take care of other family members. This is not to say that low-income parents teach their children to ignore their personal interests, but low-income families generally cannot afford to encourage the (extreme?) degree of individualism embraced by middle-class families. Low-income families need everybody to pitch in with childcare, cooking, housecleaning, emotional support, and/or bill-paying.

Linda Burton (2007) offers the concept of “adultification” (p. 336) to describe this phenomenon in low-income families. Adultification happens when “youth are...exposed to adult knowledge and assume extensive adult roles and responsibilities within their family networks” (Burton, 2007, p. 338). She outlines four degrees of adultification. 1) “Precocious knowledge,” (Burton, 2007, p. 336) experienced by the vast majority of Burton’s sample, happens when children share in adult worries and frustrations, especially concerns about covering basic needs like food, housing, and healthcare. Children become aware of these concerns by hearing adults discuss them, sometimes with each other, sometimes directly with their children. 2) In “mentored-adultification,” (Burton, 2007, p. 338) children take on not only adult-like perspectives (worries about money and so forth) but also some limited adult-like tasks, conducting those tasks with little supervision from adults. For instance, a child in this stage of adultification might cook dinner for the family several nights a week and make sure the house is clean when their parents come home from work. 3) “Peerification” (Burton, 2007, p. 338) involves children assuming so many adult tasks and responsibilities that the hierarchy between parent and child starts to dissolve. Parents may confide in their children as peers, and children may see themselves as holding equal status and authority as their parents. One quote from Burton’s data summarizes this attitude: “My father and I bring the same amount of money into the house every month to pay the bills. So, I have the same rights he does. I can do what I want” (Burton, 2007, p. 339). 4) The rarest and most intense level of adultification is “parentification” (Burton, 2007, p. 339), in which children assume not just adult responsibilities but full time quasi-parental responsibilities for their siblings and/or their own parents.

While parentification almost always harms young people, other forms of adultification can be quite healthy. For instance, understanding the dangers of payday loan agencies (an example of precocious knowledge) may help a young person be appropriately weary when handling her own paychecks. Likewise, youths whose parents have taught them to handle some important household task like making dinner (an example of mentored adultification), may express higher levels of self-esteem and personal responsibility (Burton, 2007).

For our purposes, the most important point to draw from Burton’s study is not whether adultification is good or bad for youth. Rather, the concept of adultification merits attention because it highlights how adolescents in economically stressed households are likely to understand their obligations to care for family members. It is exceedingly common for low-income adolescents to be intimately aware of their families’ material and emotional needs, and they frequently see themselves as

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6 This definition raises the question of what counts as “adult knowledge...roles and responsibilities” in the first place. Burton recognizes that societies construct definitions of adulthood and childhood, that these are not natural categories. She utilizes common Western institutional (and, importantly quite middle-class) understandings of children’s and adults’ roles and responsibilities because her article addresses social workers, teachers, and other representatives of these institutions. She wants to help these professionals see how low-income children are stuck between a “rock and a hard place’ as they navigate multiple worlds while simultaneously being considered a child by some ‘adult’ by others...For example, the assertive behaviors children exhibit in managing their homes can be viewed as assets by their parents and as liabilities when children exercise those same behaviors in the classroom” (2007, p. 331).
at least somewhat able and responsible to provide for those needs. That sense of responsibility is instilled before they graduate high school, long before they start their freshman years of college.\(^7\)

Do low-income college students take this awareness of family needs and obligations with them to college? Sarah Goldrick-Rab’s book, *Paying the Price: College Costs, Financial Aid, and the Betrayal of the American Dream* (2016), touches on that question. Her in-depth interviews with low-income college students suggest that they do indeed carry a sense of family responsibility on to campus. As an example, Goldrick-Rab (2016) describes the experiences of student “Ian William” (a pseudonym):

Growing up poor, the idea that family members would help each other out as needed was a given in Williams’s home. “That’s how my mother raised us,” he explained in an interview, “If a piece of us falls, we all fall.” ...Williams’s father made his expectations clear. “You’re always supposed to look out for your family, no matter how much money you’ve got”...When Williams became a college student, his family’s longtime practice of sharing continued. He shared his limited funds—from grants, loans, and work—with his mother and brothers. The financial-aid system assumed that Williams’s family was helping him by providing his [Expected Family Contribution] of $425 annually, but his mom couldn’t make that payment. Instead, Williams paid the EFC with student loans, and he used his financial aid to help her. He explained, “My mama was my motivation. She kept me out of trouble and that type of environment, even though it was hard for her because she was going to work most of the time ... That’s why I’ve got to do something; I’ve got to help my mother out.” (pp. 149-50)

The Williams’ perspective was not particularly unusual in Goldrick-Rab’s study. Of the students she surveyed who lived on campus, 11% reported providing $50 to their families per month and 14% reported contributing 10 hours per week to their family’s childcare and eldercare needs (p. 156). These numbers may be underreported. Goldrick-Rab observed that her interviewees tended to downplay their family contributions, treating them as simply what families are supposed to do for each other. More importantly, low-income students who live off campus likely contribute significantly more to their families’ financial and labor needs.

We have here two contrasting moral visions for young adults’ responsibilities within their families. Middle-class parents teach their children to take responsibility for their professional success (no small task in the modern labor market) even while parents (and sometimes grandparents) work hard to launch their young people into economic independence (Zaloom, 2019). We can debate whether such an individualistic telos is a morally good idea, but this goal clearly holds great motivational power for middle-class families. Low-income parents cannot afford to encourage their children to adopt such an individualistic focus. They need their children to understand and invest in other family members’ welfare. At the ages of 18-24 years old, low-income college students face the

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7 Burton’s article depicts low-income’s youth’s self-perception, but her study—a 20-year ethnographic project—only looked at the experiences of a relatively small sample of people. Quantitative research, drawing on the Panel Study of Income Dynamics, Child Development Supplement of 2002, and the Transitions to Adulthood Study of 2007, paints a similar picture (Kendig, Mattingly, and Bianchi, 2014). Kendig and co-authors found that adolescents from poor families were more likely to assume adult responsibilities early and less likely to receive less financial support as they transitioned into young adulthood. Eighteen to 24-years-olds from poor or low-income families were far more likely to be completely financially independent and more likely to be parents themselves than their peers who had never experienced poverty or low-income. These same young people were more likely to have contributed financially to their households as teenagers, taken care of their siblings emotionally and materially, and supported their parents in everyday tasks. Not surprisingly, they were also more likely to worry about money and their futures.
daunting task of balancing student loans, coursework, internships, work study jobs, other side jobs, and significant family responsibilities to nuclear and possibly extended family members.

**Family Structure: Nuclear vs. Complex and Extended**

Not only may many low-income students feel a (qualitatively) more developed sense of responsibility for the wellbeing of their family members than middle-class students, low-income students may also feel responsible for a (quantitatively) greater number of people. This quantitative difference results from a variance between low-income and middle-class families so basic it is likely to go unnoticed: family structure.\(^8\) Middle-class people tend to build simple nuclear families. Low-income families tend to form more complex families who, furthermore, place a greater emphasis on extended family connections.

**Nuclear Families**

One defining feature of middle-class identity—in addition to income and educational attainment—is a common pattern of family membership. That common pattern consists of two adults who marry (often cohabiting first), then bear/adopt children, and remain married for many years if not the rest of their lives (Lundberg, Pollak, Stearns, 2016; Wang, 2018). While this “first comes love, then comes marriage” pattern has declined since the 1970s, it was still prevalent enough in 2018 that 75% of children growing up in families in the three middle income quintiles were being raised by both of their parents (Reeves and Pulliam, 2020). Marriage rates rise along with household income (Reeves and Pulliam, 2020), so professors’ children may be more likely than other middle-class children to grow up in two parent households, since professors tend to marry other professionals.

A middle-class understanding of family members’ roles and responsibilities often attends this nuclear family structure. That understanding places heavy emphasis on parents’ responsibilities to care for their children, almost to the exclusion of any familial responsibilities beyond the nuclear family.\(^9\) Consider below the narrative of a “normal” middle class family life offered by Ara Francis in *Family Trouble* (2015). The book tracks the experiences of middle-class parents caring for special needs children, whose “trouble” makes living out their life narrative impossible. This disjuncture reveals (usually implicit) expectations about what constitutes a “normal” family life:

> [P]arents imagined their own and children’s lives as unfolding along a particular trajectory. Children were, parents assumed, headed toward a higher education, marriage, and children of their own. Parents expected to take pride in their performances as mothers and fathers, to someday grow into adult relationships with their children, to become grandparents, and enjoy a retirement free of intensive caregiving. (Francis, 2015, p. 11)

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\(^8\) This quantitative difference in family size also results from the fact that, in the US, parents with the less education and income have more children per capita than parents with more education and more income (Martinez, Daniels, and Febo-Vazquez, 2018). So, even when considering only nuclear family size, low-income students are likely to come from slightly larger families. It is still important, however, to consider family membership size above and beyond the nuclear family. I suspect extra-nuclear relationships play a more important role in determining the number of family obligations students feel themselves to have.

\(^9\) Margaret Nelson describes the boundaries drawn around white middle-class family membership as a “force field” (2020, p. ix-x) which invisibly but nonetheless powerfully hinders outsiders from getting too close emotionally or physically.
This narrative (probably inaccurately) neglects the common enough middle-class expectation that adult children will need to care for aging parents. But note what else this narrative leaves out (probably accurately): it anticipates no familial obligations to great aunts and elderly neighbors, nieces and nephews, cousins and step siblings, and other extended family and family friends. The imagined family “network of care” is drawn tightly for middle-class people.

This tight focus on the nuclear family may be a geographic necessity. Young academics are especially notorious for taking whatever post-docs or assistant professorships they can land, wherever they can land them (“It’s Hard to Build…”, 2018). While panicked or gleeful trans-continental moves might be particularly common in academia, similar patterns show up among other educated professionals. People with college degrees move across state lines twice as often as people with only high school diplomas, and they move further away (Bui and Miller, 2015; Molloy, Smith, and Wozniak, 2011). Over 80% of couples without college degrees live within 30 miles of one of their mothers, compared with roughly 50% of couples with two college degrees (Compton and Pollack, 2009). Those couples often live much, much farther away. (Consider all the far-flung places where your graduate school peers landed.)

There are several possible explanations for why college graduates move further from home, but the most interesting for our purposes is that college graduates tend to marry other college graduates. If both spouses want to be employed, they often need to move to a larger city and larger labor market where they can both find jobs (Costa and Kahn, 2000). In addition to the two-career pressure, college graduates are more likely to marry persons who grew up in different states (Compton and Pollack, 2009). If one spouse is from Iowa and the other is from Florida, they cannot possibly live near both sets of family. Unless, of course, they embark on a long-distance marriage, a relationship form to which academics seem remarkably prone (Walters, 2010). Even in those cases, job locations rather than family proximity generally dictate spousal geography.

Regardless of the cause of their mobility, geographic distance makes it difficult for many well-educated couples to contribute or receive many hours of family labor within their extended kin networks. They cannot, at a distance, participate in the daily routines of family caregiving (taking Aunt Grace to her doctors’ appointment or helping nephew Bill fix his junker first car), although they may make financial contributions to extended family members’ care (i.e. chipping in to refit Mom’s house for wheelchair accessibility). The reverse is also true. Extended family members cannot offer many hours of support to far away well-educated professionals. Dual career parents know the burden of care for the little ones falls squarely and almost exclusively on their shoulders (and the shoulders of the people they hire to help). Zoom calls, cards, shared family vacations do allow extended kin to remain emotionally connected (Roschelle, 1997). But those avenues to emotional connection do not add up inevitably to material forms of interdependence.

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10 Thirty percent of Americans express the belief that family members, rather than the government or the aging parents themselves, are responsible for aging parents’ care. Seventy six percent of Americans say that providing financial assistance to aging parents is an adult child’s responsibility. Those statistics refer to the entire American populace, not just the middle or upper classes. Still, the percentage of Americans who express a sense of responsibility for aging parents is so high, it would be nearly impossible for a large proportion of middle- or upper-class people not to share those sensibilities (Pew Research Center’s Social & Demographic Trends Project, 2015).

11 Middle-class families’ actual “network[s] of care” (Hansen, 2004, p. 12) may be more expansive than their family ideologies suggest, but the ideology of the independent nuclear family remains strong.

12 And hire help they understandably do. The higher a family’s income, the more likely they are to pay for licensed childcare, rather relying on family members or possibly less expensive non-licensed providers. The more education a child’s mother has, the more money that her family tends to spend on childcare (Malik, 2019).
So, it makes a great deal of sense for well-educated, middle-class people, like professors, to imaginatively locate most family responsibilities within the nuclear family. Furthermore, we should expect faculty persons’ deepest relationships to reinforce similar expectations, since most faculty were raised by college educated parents, and tend to marry college educated spouses (Cohen, 2013). They also tend to stay married to these spouses (Wang, 2015). In doing so, well-educated people either teach their children to value stable marriages, or show them how stable marriages work, or possibly both (Amato and DeBoer, 2001). And, as discussed above, college educated people spend extraordinary sums of money to send their children to college, launching them into marriage and job markets that require geographic mobility. In sum, what we have here is a self-reinforcing cycle of college-educated, geographically-mobile nuclear families generating college-educated, geographically-mobile nuclear families.

This is not to say that educated middle class families (faculty or otherwise) always live out their visions of family life (Hansen, 2004). It is simply to say that the middle-class moral imagination readily perceives the responsibilities accrued in the nuclear family—especially childcare responsibilities. The nature of family responsibilities above and beyond the nuclear family may be murky to them. That murkiness makes it harder to anticipate, understand, and constructively respond to the conflicts our students face between academic responsibilities and family responsibilities arising outside the nuclear family.

Extended and Complex Families

Arise they likely will. Membership structures of low-income families tend to differ in two ways from middle-class families: low-income families exhibit more complexity, and they place greater importance on extended family relationships. The cumulative effect of these differences is that low-income students’ family responsibilities will often be more numerous than their middle-class peers. There are simply more people to whom low-income may feel potentially responsible to provide care.  

Family complexity

To explain the meaning of “family complexity” it is perhaps easiest to start with a working definition of a “simple” nuclear family, which consists of two parents and their biological children living in the same household. A family grows more complex with every parental or sibling relationship that diverges from that form (Manning, Brown, and Stykes, 2014). For example, The Simpsons are a simple family (two parents who produce biological offspring) while the family Julia Roberts joins in The Stepmom is slightly more complex (both children are biologically related to each other and the father but not the...

13 In claiming that most faculty persons were raised by college educated people, I am extrapolating from the family backgrounds of all people who earned doctorates (National Science Foundation, 2018). That extrapolation is imperfect since not all professors have doctorates and not all people with doctorates become professors.

14 These two phenomena, family complexity and close ties with extended family, feel very similar, almost like two different ways of saying the same thing. They both depict a complex web of family relationships; there is a certain symmetry here. Nonetheless, these phenomena are distinct. Complexity refers to the composition of the nuclear family, while extended family ties refer to relationships beyond the nuclear family. It is possible for a simple, stable nuclear family to enjoy a rich network extended family and friends. Likewise, members of a complex family—who may move frequently between households, parents, etc.—may have a harder time keeping up with extended relatives.

15 Average household size varies only a little bit by class, as measured by educational attainment. The average number of people in the most educated households is 2.51; the average number of people in the least educated households is 2.78 (“America’s Families and Living Arrangements: 2016,” 2016). However, average household size is not the same thing as average family size, since important members of one’s family—parents, siblings, half-siblings, extended family members—may reside outside one’s household.
stepmother). *The Brady Bunch* is more complex (three children are biologically related to each other but not to the other three children, and all children are biologically related to one parent but none are related to both parents). The Kardashian/Jenner clan is more complex still, involving full, step, and half-siblings growing up among parents, step-parents, and former step-parents. Generally, harder-to-draw family trees mean more complexity.

As evinced by the examples above, family complexity usually results from “union instability” (Musick and Michelmore, 2018, p. 1390). Union in/stability is a measure of the duration of intimate cohabiting or married partnerships. Union stability correlates strongly positively with education; college educated people tend to get married and stay married; less educated people marry and later divorce or cohabitate and later separate with higher frequency (Musick and Michelmore, 2018).

This is not to say more educated or higher earning people value commitment to their romantic partners more. Survey results from more than 6000 Floridian respondents indicate that low-income, middle-income, and high-income people are quite similar in their expressed approval for marriage, disapproval of divorce, and personal trouble in navigating conflict in intimate relationships (Trail and Karney, 2012). Moral commitments regarding marriage do not differ much by class. Other stressors—chronic financial precarity, for instance—provide a better explanation for higher divorce rates among low-income couples than attitudinal differences (Trail and Karney, 2012).

Family complexity, almost by definition, tends to expand the size of a family, as step-parents add themselves and often step-children to the household (at least part time). These family expansions may generate both more resources and more responsibilities for college students. Perhaps a stepmother will help pay for her stepson’s text books. Likewise, if a stepsister needs a place to stay for a couple of weeks, a student might feel obliged to offer her couch. Complex families produce more potential—and sometimes more actual—relationships of responsibility than nuclear families produce.

**Extended Family**

“Family complexity” may not, however, be the most relevant concept for understanding low-income students’ family structures. By focusing on nuclear families (simple or complex), the family complexity literature neatly sidesteps another important set of kin relationships: extended family and close family friends. These relationships are harder to study through census records and other traditional survey instruments. Still, the fact these relationships elude easy measurement does not *ipso facto* render them less important to low-income students.

Writing in the wake of the Moynihan Report, Carol Stack’s oft-cited 1974 ethnography *All Our Kin: Strategies for Survival in a Black Community* certainly argues otherwise. Stack highlighted the critical role extended family and friend networks could play in sustaining low-income African American families, materially and emotionally. Her book kicked off waves of research along similar lines, including Dan Clawson’s and Naomi Gerstel’s *Unequal Time: Gender, Class, and Family in Employment Schedule* (2014).

*Unequal Time* probes the relationship between a family’s *labour schedule* and a family’s *membership structure*. It offers the concept of the “web of time” (Clawson and Gerstel, 2014, p. 3) to show how the most powerful ties that bind are not necessarily ties of blood or marriage. Rather, they are the ties tethering one person’s schedule to multiple other persons’ schedules. For low-income workers, family is the girlfriend of your cousin who helps take care of your children while you’re at work. Or, family is the sister-in-law you take to medical appointments because you own the only car in the extended family. Family might even be the co-worker who picks up your shift when your toddler comes down with a fever. Being family is less about sharing a roof or a last name than it is about sharing a calendar.

*Unequal Time* implies (though does not explicitly argue) that the same rule applies for wealthier workers: kin are the people you rely on for no pay in a time crunch. It’s just that wealthier families
tend to deal with time crunches within the nuclear family. A parent—often a mom—takes off work to stay home with a sick kid. She may be the person responsible to make sure the family vehicles are newish and well enough maintained to avoid broken-down car trouble. Extra income and, to some extent, traditional gender norms enable middle- and upper-class families to meet family labor needs in house or through market-based relationships rather than affective ones.

A particularly clear example of this class-based definition of family is Clawson and Gerstel’s observations of Certified Nursing Assistants’ responses to their employer’s family bereavement policies. CNAs objected that their employers treated the loss of a partner or child as more important than the loss of a grandparent or sibling, awarding employees 3 and 2 days of leave respectively. Of course, CNAs objected to the short time allowed them for grieving. (Consider: would you be able to return to work three days after your child died?) But that was not their only or even their primary objection; they also protested the assumption that nuclear family relationships were more important than extended family relationships: “I need a week for my grandmother!” “And only two days for my sister?” “At least, say not a difference in days for these extended family relationships compared to nuclear family relationships” (2015, p. 172).

One can understand employers’ desire to draw neat lines around who counts as “family.” If we take a step back and look at the bereavement policies from a mathematical standpoint (a morally dubious exercise), the CNAs’ proposal could multiply the number of bereavement days they take. More frequent bereavement leave creates more paperwork for HR, more hassle for the scheduling manager, and reductions in profit margins. Faculty and university administrators face similar pressures. Should we grant paper extensions when a student loses a cousin? If a student wants to take a mid-semester leave-of-absence to grieve a great-aunt, should the Financial Aid Department allow it? Such decisions could cost us time, hassle, and money. How many of these relationships can our students have?

Possibly quite a few. We should expect that many low-income students will have grown up depending on extended kin and close family friends for care. It makes sense that they would see these family members as people to whom they owe concern and investment, that they would feel both affective and moral connections to this social web. The relational threads of this web may very well be more numerous than nuclear families’ tightly bound knots of care. Like complex family structures, extended family structures may expand the number of persons to whom students feel a sense of caregiving obligation.

In sum, compared to middle-class students, we should anticipate that many low-income students will possess (quantitatively) more family relationships and (qualitatively) deeper kinds of responsibility within those relationships. Their family obligations could include time for child or elder care, emotional attention, and/or financial support. Even when family members do not call upon their college students to fulfill family obligations, low-income students may very well carry an extra burden of stress. Knowing their families could use their help at home—even if they do not ask for it—could make it harder to invest a summer in an unpaid internship or pay a little extra attention to their statistics homework. These demands on students’ “bandwidth” (Verschelden, 2017) are often subtle. It would be unsurprising if middle-class professors missed them entirely. While understandable, this lacuna can still undermine our ability to support our students’ learning.

**Implications for Practice**

What are we to do with this mismatch of moral visions? Middle- and upper-class faculty’s first task is to identify strategies that will help us better understand our students’ moral experiences. Reducing the trade-offs students face between fulfilling academic and family obligations should be our ultimate but
also secondary goal, to be pursued after faculty and institutions acquire an understanding of the particular kinds of trade-offs their specific student populations face.

The most immediate action faculty can take is to begin talking with their students about their family responsibilities. Broaching this subject is not easy or ethically straightforward. Prying into students’ personal lives is morally bad, and students should not feel that their grades depend on building rapport with faculty by sharing private information. On the other hand, students often need to know that their instructors care about the challenges they face outside the classroom; they need to know that family obligation is an acceptable topic to broach with their instructors.¹⁶

One way of broaching this topic is to lead students through a general “values affirmation” activity (Verschelden, 2017, p. 79) at the beginning of a course. While such activities can take many forms, one common practice involves inviting students to select from a list of key values their top ten, then narrowing that list to their top three values, and then writing a letter describing “why these values are important to you and what difference they have made in your life. Give some examples of things you have done or choices you have in your life based on these three values” (Verschelden, 2017, p. 82). Students, especially low-income students, can gain multiple benefits from this simple activity, including better grades, higher retention rates, and improved subjective well-being (Verschelden, 2017, p. 79). Just as importantly for our purposes, this activity could improve student-faculty communication about family responsibilities (and students’ other motivating concerns) in two ways. First, it provides faculty with critical information about students’ overall value commitments, including but not limited to family responsibilities. This understanding could help us better anticipate generally when students’ academic goals and other values might be in tension. Second, spending class time on a values-affirmation activity communicates to students that faculty genuinely care about their moral concerns. This care may make it easier for students to engage faculty in problem-solving when they face trade-offs between fulfilling family and academic responsibilities. For instance, if a student has already told her accounting instructor that the desire to improve her family’s economic situation motivated her to study finance and that student felt understood and affirmed by her instructor in that commitment, then that student might feel more comfortable requesting an extension on a paper when she needs to spend the weekend caring for a sibling rather than writing a paper due Monday. Values-affirmation activities are not magic bullets, but they do demonstrate the kind of conversation-opening practices faculty can utilize to better grasp students’ moral situations.

In addition to speaking with students directly about their values and family obligations, faculty can gain insight by talking with student affairs staff, particularly those who work closely with first-generation college students. In order to support these students’ academic personal and success, staff need to grasp first-generation students’ “lived experience” of navigating a social environment that is more-or-less foreign to their families of origin (Troy et al., 2022, p. 1). These staff take note of which students spend most weekends off-campus, taking care of family needs, how students spend financial aid checks, not just on books but on meals for family members, why students worry about representing their families well, etc. (ibid, 2, 7). These professionals can interpret students’ lived experiences to their faculty, but not all institutions facilitate those kinds of conversations. Faculty forums, lunch-and-learns, communities of practice, and other gathering types could be used to regularize discussion among faculty and student affairs staff about students’ family obligations.

Last but not least, faculty can contribute to research that systematically compares faculty’s perceptions of their students’ family obligations with low-income students’ own perceptions. Some

¹⁶ In this respect, faculty are in a similar position to workplace managers. We have an opportunity to invite negotiation and constructive problem solving so that school/workplace tasks can be fulfilled without compromising the student/worker’s family’s wellbeing. But maintaining proper boundaries, protecting family from surveillance by the teacher or employer, is an ongoing challenge.
research exists regarding first generation and low-income students’ understanding of their roles in their families (Berg, 2010, p. 70; Mitchell & Jaeger, 2018) though there is certainly much work still to be done on this front (Bettencourt et al., 2022). Faculty perceptions of low-income students’ family responsibilities seem to have received little or no attention. Likewise, I have not found any research comparing these two vantage points (though I would be happy to be corrected).

Given this dearth of research, faculty who underestimate low-income students’ family responsibilities are likely in very good, and certainly very numerous, company. To improve our understanding of students’ family obligations, we need not wait for the emergency of academic research (welcome though it is). We can begin improving our praxis through conversations about students’ family obligations on our campuses, among experienced faculty, student affairs professionals, and students themselves.

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To Chat or Not To Chat: Text-Based Interruptions From Peers Improve Learner Confidence in an Online Lecture Environment

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Abstract: Technology-driven interactions are becoming commonplace, particularly as online classes, telecommuting, and virtual meetings across distances and time zones have all increased in popularity. Platforms such as Google Meet, Skype, Webex, and Zoom use synchronous audio-visual communication supported by text-based chat, emoticon responses, and other supplementary functions. Given this uptick in the use of video conferencing with dynamic integrated features, it is important to understand how attention and cognitive resources may be taxed in these environments, and what that may ultimately do to participants’ ability to comprehend the target content. In the current study, we investigated the impact of topically-relevant student-initiated text chat frequency on comprehension during an online lecture. The findings revealed that chat involvement alone does not affect learning itself. Chat activity was found to not be a distraction but in fact, a facilitator of increased confidence in learning in an online lecture environment when controlling for other outside distractions. Overall, the findings suggest that relevant chat content is not distracting and can be helpful in reinforcing concepts through supportive examples in adjacent modalities.

Keywords: Distance education and online learning, teaching/learning strategies, cooperative/collaborative learning

Technology-driven interactions are becoming commonplace, particularly as advances in software, audiovisual equipment, and communication-based interfaces make these interactions easier (Hacker et al., 2020). Online classes, telecommuting, and virtual meetings across distances and time zones have increased in popularity in the last 20 years (Hacker et al., 2020; Wilcox, 2000). Distancing, isolation, and quarantine requirements due to the COVID-19 pandemic have accelerated this shift, putting pressure on for an immediate pivot to fully virtual learning and meeting (Hacker et al., 2020). From nursery school classrooms to Fortune 500 Boardrooms, video conferencing interfaces have become popular substitutes or supplements to in-person interaction, particularly in the face of public health constraints (Hacker et al., 2020). The flexibility of these virtual spaces is advantageous, from eliminating unnecessary commutes to increasing accessibility. Even in a post-pandemic world, it seems inevitable that video conferencing and virtual interaction will become a mainstay.

There are several software options that support virtual interaction, including Google Meet, Skype, Webex, and Zoom. These platforms all share synchronous audio-visual communication as a central feature and offer a suite of interactive features such as raising a digital hand, polling, emoji responses, mute, video on/off, and text-based chat (to the full group or to selected participants within the group). The chat function can be used to share extra information, supplemental details, file attachments, or web links with participants in real-time. All of these options provide ways for participants to actively engage and contribute to a meeting or lecture. This flexibility affords a significant amount of interactivity despite the constraints of being tethered to a computer. Given this
upick in the use of video conferencing with these enriched features, it is important to understand how attention and cognitive resources may be taxed and what that may ultimately do to participants’ ability to comprehend the target content. Specifically, the impact of text-based chat on comprehension of online video lecture content is of interest in the present study.

Effective learning draws heavily on an array of cognitive processes, including memory and attention. Research in cognitive psychology makes plain the necessary conditions and resources for effective retention of learned information (Bjork & Bjork, 2011; Dunlosky et al., 2013; Putnam et al., 2016). In memory, information is encoded, or acquired and represented in the mind, stored for a period of time, and then retrieved in order to be used (McDermott & Roediger, 2014; Melton, 1963). In order for effective learning to occur, a student must engage in successful encoding of the material as well as successful retrieval (Bjork & Bjork, 2011). Meaningful encoding can be accomplished through connecting newly learned information to already-learned information, and by developing strong, detailed representations of a new construct (Bjork & Bjork, 2011; Dunlosky et al., 2013). Once a learner has invested some time and effort into developing an adequate representation of the newly learned information, the new information can be held in storage indefinitely (McDermott & Roediger, 2014). When it is time for the information to be used, it must be pulled out of memory via a retrieval process (Bjork & Bjork, 2011; Melton, 1963). Retrieval is successful when the targeted information is called back and can be reported, used, or shared. Effective retrieval can be difficult to accomplish, especially when the process is unpracticed (Bjork & Bjork, 2011; Dunlosky et al., 2013). Many strategic interventions to improve learning in college students focus on retrieval practice and the development of effective retrieval strategies (Dunlosky et al., 2013; Putman et al., 2016). In short, the memory processes that drive successful learning are effortful and require both time and cognitive resources.

Because of this high demand for cognitive resources during the learning process, it is no secret that multitasking affects comprehension and learning outcomes. Early groundwork in both cognitive load theory (Chandler & Sweller, 1991; Sweller, 1988) and working memory theory (Baddeley, 1998) argue that engaging in multiple tasks can demand more resources than are available, leading to deficits in processing, performance, and learning. In addition to the cognitive demands of the task at hand, distractions in a learner’s environment further contribute to the mental workload required to engage and learn. Even simple background distraction promotes sharing of attentional resources, which contributes to declines in performance. For example, participants completing a digit span task performed better when working in silence, rather than when distracting auditory stimuli like instrumental or vocal music were played in the background (Alley & Greene, 2008). The effects of distraction are especially pronounced when individuals have to effortfully attend to more than one thing at a time. In one study of reading comprehension, participants were asked to study a passage either in silence or while an informative video played in the background (Lee et al., 2012). Participants that read in silence performed better on a comprehension test than participants that read with a background video playing.

In addition to everyday environmental distractions, the modern classroom is rich with distraction opportunities as well. The increased availability of technology in learning spaces presents a tremendous opportunity for attentional disruption to take hold (Ravizza et al., 2017). In a study of introductory psychology students, Ravizza and colleagues (2017) showed that students engage in a wide variety of technology-based distractions during class, including web browsing, engaging on social media platforms, streaming television or sporting events, and playing games. Multiple studies have demonstrated that these multitasking behaviors during class can impact a student’s learning and comprehension outcomes (Sana et al., 2013), and ultimately affect course grades (Ravizza et al., 2017). In addition to demonstrating the negative effects of in-class laptop multitasking on lecture comprehension, Sana and colleagues (2013) showed that laptop multitasking was detrimental to learning outcomes of students who were not multitasking, but who could view the screens of in-class
multitaskers. That is, even when a student attempts to focus on the lecture material, their attention can be disrupted by the behavior of a nearby multitasking classmate. In short, increased access to technology has lifted the cap on distraction opportunities in the traditional classroom.

Online learning environments are a unique context for distraction research, as students may engage in synchronous online work in the face of a multitude of environmental distractions. Not surprisingly, a wide variety of run-of-the-mill distractions that affect in-person learning can affect comprehension of lecture content in online learning environments as well (Blasiman et al., 2018). In one study, participants watched an online lecture while simultaneously engaging in any number of tasks, ranging from motor tasks (i.e. folding laundry, playing a video game), passive communication tasks (i.e. playing either a low- or high-arousal video in the background), or active communication tasks (i.e. taking a phone call or texting). Having a conversation was most detrimental to measures of comprehension, but all six forms of distraction resulted in significant performance declines when compared to participants in a no-distraction control condition. Blasiman and colleagues’ (2018) findings strongly suggest that any form of distraction, regardless of modality, arousal, or degree of demand significantly affects student success in online learning. These findings build on those suggested by Zeamer and Fox Tree (2013) which indicate that concurrent speech information (e.g. overhearing a nearby conversation) can impair learning and comprehension for short recorded lecture sessions.

Much of the research regarding the cost of managing two competing streams of language (i.e. written text messages and auditory lecture material) has been motivated by the ubiquity of cell phones, and is particularly relevant now given the introduction of chat functions in online learning environments. Texting while listening to a lecture reliably impairs comprehension, regardless of the texter’s level of proficiency, experience, or confidence. In multiple studies, participants have been assigned to text messaging or non-text messaging conditions while being asked to attend to a lecture (Barks et al., 2011; Dietz & Henrich, 2014; Gingerich & Lineweaver, 2013). Consistently, participants assigned to engage in text messaging during the lecture performed significantly worse than participants who did not text (see Chen & Yan, 2016 for review). Interestingly, proficient texters performed worse on lecture comprehension assessments than text messaging novices, suggesting that texting proficiency contributed to more switching between the two tasks (Barks et al., 2011). Participants’ awareness of distraction (Dietz & Henrich, 2014) did not moderate the relationship between texting and test performance, but participants who did not engage in text messaging felt more confident in their performance on the comprehension task (Gingerich & Lineweaver, 2013). In short, engaging in text message distractions has been shown to contribute to poorer learning outcomes when the text information was irrelevant to the target information being presented.

The specific cost of competition for the same attentional resources across different modalities is particularly relevant to understanding the impact of concurrently processing audio-based lecture content and text-based chat, but the mechanism for this performance cost is a source of extensive debate. When two simultaneous tasks demand the same cognitive resources (e.g. perceptual discrimination, tactile/spatial manipulation, language), interference between the two tasks may lead to a cost in overall performance (Bourke et al., 1996; Chandler & Sweller, 1991; Sweller, 1988). Salame and Baddley (1989) argue that simultaneous reading and processing of auditory information compete for shared phonological processing resources, resulting in decreased performance. Pashler (1990) suggests that when two tasks require the same mechanisms or resources, queuing takes place prior to execution, whereby one task takes priority and the other waits. Cognitive Theory of Multimedia Learning (CTML; Mayer, 2005) suggests that the working memory resources required for both auditory processing of spoken language and visual processing of written language are the same, as they require the organization of words to contribute to the verbal model. So, competition for verbal resources simultaneously in a multimedia learning environment could inhibit comprehension and
Regardless of the attentional mechanism, it is clear that sharing language resources across auditory and visual processing of language tasks results in poorer comprehension (Lee et al., 2012; Zeamer & Fox Tree, 2013).

In each of these studies, text-based information was irrelevant to the target lecture information. In addition to the required attentional shift from texting to lecture-watching, the contents of the message were also distracting. However, research in multimedia learning indicates that topically relevant text information may not necessarily be subject to the same rules and principles. Mayer & Moreno (2003) describe several mechanisms through which cognitive load is increased in multimedia learning. When both essential and incidental processing are required simultaneously, as is the case when students are viewing a lecture and managing text-based information (e.g. chat activity) the essential processing (e.g. attending to the lecture) is encroached upon by incidental processing (i.e. following the conversation in the chat; Mayer & Moreno, 2003). For example, Wecker (2012) shows that students who are asked to listen to a lecture while viewing a set of accompanying text-heavy presentation slides tend to suppress auditory processing of the oral lecture information in service of reading the slide text. To avoid significant impairments in comprehension, a weeding strategy is recommended, such that the extraneous information is eliminated to better allow students to focus on the essential processing task (Mayer & Moreno, 2003). This weeding strategy may give rise to a coherence effect, where participants better comprehend multimedia information when “interesting but extraneous material” is eliminated (Mayer & Moreno, 2003). Confirmed by Wecker’s (2012) test of concise and reduced-text slides, students retain more information during lectures when supplemental material is not simultaneously provided.

It is possible that integrating relevant text-based information alongside targeted lecture information may improve, or at least not hinder, comprehension and retention. Some studies indicate that leveraging the interactive or dynamic nature of multimedia interfaces can be advantageous and is preferred by learners. Xie (2018) showed that learners retained information better when both visual and auditory cues were coordinated during a lecture, compared to visual only cues or no cues. In contrast with Mayer and Moreno (2003), Xie (2018) showed that coordinated presentation of essential and extraneous information improved test performance compared to presentation of essential information alone, suggesting that co-presentation of relevant information can help students solidify their own comprehension. In addition to improvements in comprehension, multimodal presentation also can change the frequency of important learning-related behaviors. Lee and colleagues (2013) showed that students who used an online home learning system preferred using both text and video to communicate, rather than just one single modality. Students in these multimodal environments asked questions more frequently than they would have done in traditional in-person school settings. In addition to these changes in behavior, students also reported beliefs that their comprehension was better off in a multimodal environment than in a non-video conferencing platform (Lee et al., 2013). These studies indicate that incorporating relevant text-based information alongside lecture information can improve beliefs about comprehension and personal judgments of learning (JOL).

In these new remote learning environments, interfaces such as Zoom are equipped with built-in chat functions that are fully integrated with the lecture environment. Instead of spreading attentional demands across multiple devices, Zoom chat windows allow for the secondary extraneous information to be presented in the same general visual field that the essential information occupies, reducing the visual task-switching cost (LaBerge & Brown, 1986). There is limited research on the impact of text chat-integrated environments for learning, but some preliminary work indicates that using the text chat function may be helpful in some aspects of secondary language learning (Kozar, 2016). Text chat can be used to introduce new terms, provide additional information, deliver feedback and corrections, or maintain an agenda for the session (Kozar, 2016). When used in alignment with
the contents of the lecture or learning task, text-based chat may facilitate, or at least not harm, comprehension of the target material.

Beyond actual performance outcomes, students’ perceptions of their own learning are easily influenced by distraction (Alley & Greene, 2008; Barnes & Dougherty, 2007; Blasiman et al., 2018; Gingerich & Lineweaver, 2014). These perceptions are commonly measured using JOLs, or self-reported judgments of learning (Dunlosky et al., 2005; Koriat, 1997). Making accurate JOLs requires students to be aware of the potential threats to their own learning, and to account for the impact these factors may have on learning outcomes. This metacognitive task often results in overconfident judgments, whereby students provide JOL estimates that exceed their actual performance on an assessment (Koriat & Bjork, 2005). Surprisingly, Blasiman & colleagues (2018) have shown that moderate levels of distraction during a learning task can improve JOL accuracy, suggesting that students’ awareness of the impact of certain distractions may contribute to more accurate metacognitive judgments. These JOLs can contribute to students’ decisions about how to manage distractions in their own learning environments in the future. In the current study, we investigate the impact of both imposed distractions (i.e. incidental information via text-based chat) and students’ awareness of existing distractions (e.g. other environmental noise) on JOL accuracy for essential information.

With the growing integration of technology in classrooms (and everyday life) the prevalence of distractions and the pressure to manage them in real-time has grown as well (Calderwood et al., 2014; Lee et al., 2012; Jacobsen & Forste, 2011). Depending on the lens with which the current virtual learning context is viewed, it’s possible that text-based chat interjections could be a harmful distraction (Blasiman et al., 2018; Wecker, 2012) or a helpful supplement (Kozar, 2016; Lee et al., 2013; Xie, 2018). The competition for resources required task switching, and increase in cognitive load may compromise comprehension and undermine learner confidence. Alternatively, the added stream of relevant information may serve to facilitate comprehension and bolster confidence. In the current study, we investigate the impact of topically relevant student-initiated text chat frequency on comprehension and confidence during an online lecture. The current study evaluates the impact of increasing extraneous information on comprehension of essential information in a multimedia learning environment while accounting for the impact of existing environmental distractions. Participants engaged in a brief online lecture session and were exposed to varying amounts of topically-relevant text chat provided by actors presenting as fellow participants. Participants provided their JOLs (Blasiman et al., 2018) prior to completing a comprehension assessment comprised of a variety of free recall, aided recall, and recognition questions (Srivastava, 2013). Participants also completed a working memory task (Kirchner, 1958; Stoet, 2010; Stoet, 2017) and a digital learning self-report assessment.

Hypotheses

In the current study, we evaluate three hypotheses regarding the impact of topic-relevant chat interruption frequency and environmental distractors on test performance, JOLs, and JOL accuracy.

H1: Participants’ comprehension of lecture content will increase from exposure to topically-relevant chat activity, and this positive relationship will be impacted by both working memory capacity and awareness of other environmental distractors as covariates (Alley & Greene, 2008; Baddeley, 1998).

H2: Participants’ confidence in their own learning, as reported through JOLs, will increase with exposure to topically-relevant chat activity. This relationship will be affected by the impact of both frequency and awareness of other environmental distractors as covariates.
**H3:** The accuracy of participants’ JOLs will be negatively associated with the degree of exposure to distracting chat information as shown in previous work by Blasiman and colleagues (2013). As chat frequency increases, we expect that participants’ JOLs will decrease.

**Method**

**Design**

This study utilized a three group between-subjects design with the independent variable being chat condition, with three levels (No Chat, Moderate Chat, and Heavy Chat occurrences). The primary dependent variables are comprehension performance and JOLS. Additionally, individual differences variables (e.g. working memory capacity, distraction estimates, and digital learning and experiences assessment) were used in analysis.

**Participants**

Participants were 89 undergraduate students (77 female, 10 male, 2 non-binary) enrolled in introductory psychology courses at a small liberal arts college in the United States. The average age of participants was 18.23 years (SD = 0.61). The majority of participants (89.89%) were first-year students. The sample was composed mostly of white students (91.0%). Participants received one research participation credit for their voluntary involvement, outside of their psychology course, in the study.

**Power Analysis and Sample Size Justification**

An *a priori* power analysis was performed for sample size estimation using GPower 3.1 software. The effect size for this analysis ($\eta^2_p = 0.15$) was selected as a conservative estimate based on Srivastava’s (2013) report ($\eta^2_p = 0.2$). Using $\alpha = .05$ for a power value set at .95, the estimated sample size required was approximately $n = 93$. Given the challenges inherent in recruiting participants for a study via entirely synchronous remote sessions in the midst of a global pandemic, the current study sample was just shy of this targeted sample size. Ultimately, the achieved sample size of $n = 89$ was sufficient for the objectives of the study.

**Materials**

The synchronous data collection sessions were conducted via Zoom. All self-report questionnaires and assessments were delivered via Qualtrics survey software. To clarify the order materials were presented for both the non-counterbalanced and counterbalanced conditions, a task diagram is presented in Figure 1.
**Figure 1.** Task diagram displaying the procedure order for both the non-counterbalanced and counterbalanced conditions.

**Lecture**

The lecture delivered by the researcher was a brief and detailed overview of the fundamentals of language from a cognitive psychology perspective. The lecture consisted of 1,644 words and took approximately 8 minutes to deliver in its entirety at a typical conversational pace. To simulate an authentic synchronous online learning environment, this lecture was delivered live during each data collection session by the same speaker. The lecture script is presented in Appendix 1.
Chat Contents

Two researchers acting as student participants engaged in scripted conversation in the public-facing chat area during the lecture. In the No Chat condition, the actors did not enter any information into the chat. In the Moderate Chat condition, the actors engaged in 4 paired chat instances at spaced intervals throughout the lecture. In the Heavy Chat condition, the actors engaged in 8 paired chat instances throughout the lecture. These chat interactions were scripted and locked to the content of the lecture. Chat instances, timing, and content are provided in Appendix 2.

Working Memory Task

The n-back task (Kirchner, 1958) measured an individual’s working memory capacity by presenting single digit stimuli sequentially and asking the individual to recall if the current stimulus was the same stimulus that was present “n” trials ago. In this study, we implemented a 2-back version of this task. Participants were provided with one block of 25 practice trials before completing 2 blocks of 25 test trials each. This version of the n-back task was conducted using PsyToolKit (Stoet, 2010; Stoet, 2017) Accuracy and response time measures across all 50 test trials were collected for each participant. Both speed and accuracy measures of working memory capacity were computed. Mean accuracy was determined by computing the mean number of correct responses in each test block. Average speed was determined by computing the mean response time in milliseconds for each correct response in all trials across both test blocks.

Judgments of Learning

The Judgements of Learning Questionnaire, modeled after the questions used by Blasiman et al., (2018) examined how confident individuals feel that they understood the information presented in the Zoom lecture using a 10-point Likert scale ranging from low to high level of confidence (Appendix 3). This was modified to be specific to the current study. Participants provided individual JOLs for overall learning (Overall JOL), ability to list topics discussed in the lecture (JOL - Free Recall), completing fill-in-the-blank questions (JOL - Aided Recall), recognizing material not presented in the lecture (JOL - Recognition), and answering multiple choice questions (JOL - Multiple Choice). JOL scores were determined using the raw value (out of 10) reported by participants on each of the five JOL measures.

Distraction Estimates

The Distraction Estimate Inventory (Appendix 4) assessed whether individuals were distracted during this particular Zoom lecture and what other activities they may have engaged in. Participants responded to items regarding distractions such as engaging in other tasks during the lecture, using a cell phone, chat feature interruptions, and having a conversation with another person not participating in the Zoom session. Participants’ awareness of their own baseline level of distraction during the current study was assessed using a 5-point Likert scale (ranging from strongly disagree to strongly agree) in the Metacognitive Awareness of Distraction subset of the inventory. Metacognitive Awareness of Distraction was determined by computing the mean of the eight items, including three reverse-scored items. Participants’ awareness of the frequency of distraction during the current study using a 4-point Likert scale (ranging from most of the time to never) was assessed using the Distraction Frequency Estimate subset presented in the inventory. Distraction Frequency was determined by computing the mean of these five items, including three reverse-scored items.
Lecture Comprehension

The Comprehension Assessment Questionnaire (modeled after the assessment used by Srivastava, 2013) evaluated how much content participants learned and remembered from the Zoom lecture through free recall, aided recall, and recognition questions. This assessment is presented in Appendix 5. The free recall prompt instructed participants to write as much information as they were able to remember from the lecture. The aided recall questions required participants to complete sentences with the appropriate word pertaining to the language lecture, similar to a typical fill-in-the-blank exam question. The recognition questions displayed various pieces of information that were covered by the lecture, covered in the chat, or not covered at all. For each piece of information, participants were asked to determine whether the statement was presented in the lecture using a binary “Yes” or “No” response.

Lecture Comprehension Scoring Methods

Four measures of comprehension were computed based on responses provided on the Comprehension Assessment Questionnaire. Free recall responses were scored by awarding one point per piece of lecture information correctly reported by the participant. Information that was incorrect or presented ambiguously was not counted toward the free recall score. All points were summed to determine the Free Recall Score. Two independent raters scored the free recall responses. Cohen’s $\kappa$ was computed to determine the degree of agreement on free recall scores between raters. There was strong agreement between raters, $\kappa = .868, p < .001$.

For the aided recall section, participants were awarded one point per correct target word with a maximum of 10 points possible. Incorrect, blank, or ambiguous answers were not counted toward the aided recall score. All points were summed to determine the Aided Recall Score. Participants were awarded one point per correctly identified target item for recognition questions with a maximum of 24 points possible. Incorrect, blank, or ambiguous answers received no points. Recognition Score was determined by summing all points. Overall Comprehension Scores, the primary dependent variable of interest, were computed by summing the Free Recall Score, Aided Recall Score, and Recognition Score. Correlations for all performance measures (n-back, JOLs, comprehension, and distraction awareness) are presented in Table 1.

Table 1. Correlations for WMC, Comprehension Test Performance, JOLs and Distraction Awareness Measures.

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Working Memory Capacity</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Overall JOL</td>
<td>.046</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Total Comprehension Score</td>
<td>.174</td>
<td>.318*</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Free Recall Score</td>
<td>.123</td>
<td>.219*</td>
<td>.790**</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Aided Recall Score</td>
<td>.090</td>
<td>.337**</td>
<td>.742**</td>
<td>.297**</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Recognition Score</td>
<td>.190</td>
<td>.122</td>
<td>.645**</td>
<td>.274**</td>
<td>.345**</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>7. Metacognitive Awareness of Distraction</td>
<td>.039</td>
<td>-.405**</td>
<td>-.224*</td>
<td>-.141</td>
<td>-.157</td>
<td>-.218*</td>
<td>-</td>
</tr>
<tr>
<td>8. Distraction Frequency</td>
<td>-.262*</td>
<td>-.317**</td>
<td>-.224*</td>
<td>-.108</td>
<td>-.219*</td>
<td>-.187</td>
<td>.340**</td>
</tr>
</tbody>
</table>

josotl.indiana.edu
Digital Learning & Experiences Assessment

Given the rapid increase in use and exposure to digital learning environments, participants were asked to complete a series of assessments to evaluate individual differences in digital learning preferences, experiences, and opinions. This assessment was comprised of a series of existing questionnaires that were modified to reflect current technologies. These questionnaires are oriented toward general individual differences in typical behaviors outside of this study. Each of the scales used in the Digital Learning & Experiences Assessment were scored by computing the mean response according to the guidelines from the original sources. Correlations between all digital learning measures are provided in Table 2 to evaluate reliability of participant attitudes across measures.

Computer Mediated Communication

The Computer Mediated Communication Assessment (CMCA; Scott & Timmerman, 2005) assessed individuals’ experiences with computer-based interactions using a 5-point Likert scale ranging from strongly disagree to strongly agree. These questions address a variety of feelings and opinions individuals may have when communicating through computers.

Online Learning Perceptions

The Perceptions of Online Learning Questionnaire (adapted from Astani et al., 2010) addresses individuals’ opinions of online courses compared to traditional in-person courses using a 5-point Likert scale ranging from strongly disagree to strongly agree.

Distractions

Distractions experienced while studying were assessed via a brief self-report measure developed by Mokhtari and colleagues (2015). In the current study, we refer to this measure as the Distractions While Studying Questionnaire (DWSQ). The DWSQ assesses the typical behaviors of individuals while they are completing assignments and studying for various courses. This questionnaire also addresses whether individuals feel multitasking impacts their concentration.

Student Preferences

The Student Preferences Questionnaire (adapted from Lee et al., 2013) assesses individuals’ preferences of Zoom lectures and the use of the chat feature on Zoom using a 5-point Likert scale ranging from strongly disagree to strongly agree. This was modified to assess recommendations and preferences between Zoom and in-person lectures as well as to additionally assess preferences of the chat function on Zoom.

Zoom Chat Tendencies

The Zoom Chat Tendencies Questionnaire examined participants’ existing chat feature usage in Zoom. Participants answered questions regarding frequency of chat use, specific conditions for chat use, and reasons why individuals may or may not use the chat feature. All questions and response options are presented in Appendix 6.

* \( p < .05 \), ** \( p < .01 \)
Table 2. Correlations for Digital Learning & Experiences Measures.

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. DWSQ - Prevalence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. DWSQ – Impact</td>
<td>-.049</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Preference – Zoom</td>
<td>-.044</td>
<td>-.054</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Preference – Zoom Chat</td>
<td>.209*</td>
<td>.017</td>
<td>.200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Perceptions of Online Learning</td>
<td>.077</td>
<td>.018</td>
<td>.704**</td>
<td>.167</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. CMCA</td>
<td>.150</td>
<td>.051</td>
<td>-.571**</td>
<td>-.298**</td>
<td>-.576**</td>
<td></td>
</tr>
<tr>
<td>7. Zoom Chat Tendencies</td>
<td>-.102</td>
<td>-.108</td>
<td>.112</td>
<td>.648**</td>
<td>.160</td>
<td>-.267*</td>
</tr>
</tbody>
</table>

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

Procedure

After confirming consent via an online form, participants were provided a link to the current study’s Zoom room. Participants were initially sent to the waiting room, a temporary digital holding space outside of the main Zoom meeting room. The instructions on the waiting room screen asked participants to change their current username to a unique numeric identifier, generated from components of their student ID number. The instructions also asked participants to close all other web browser windows, and to wait to be admitted to the main room. The two actors were also logged in as participants and followed these instructions accordingly.

At the start of the session, participants were admitted from the waiting room to the main meeting space. The researcher, whose camera remained on for the duration of the study, welcomed participants, reminded participants to update their usernames to reflect the unique identifier, and stated that the session would be recorded, including all chat, audio, and video activity. Participants were notified that they would remain muted, and that they had the option to turn their cameras on or off for the duration of the study. Both actors left their cameras on throughout the experiment.

The researcher explained that participants would answer some questions about themselves, would participate in a simple short term memory test, would listen to a short lecture, and would take a brief test to assess what they’ve learned. The researcher then explained that the various components of the study required that the participant use links to access different pages, and that these links would be provided in the chat area. Participants were notified that they should continue to remain logged into the Zoom room for the duration of the study, and that they should always return to the Zoom room after the completion of each task. At the conclusion of each task, participants were asked to use the “Raise Hand” function to confirm that they were ready to proceed with the next segment.

Participants were then provided with a link to the initial Qualtrics-based survey which contained the demographic self-report and the Digital Learning and Experiences Assessment. At the conclusion of this set of assessments, the Qualtrics page reminded the participants to return to the main Zoom room and click the “Raise Hand” button to confirm that they were prepared for the next segment.

Participants were told that the next segment of the study involved a brief test of short-term memory. Participants were asked to access the task via a new link in the chat, and were reminded to follow the instructions on their screens. The link to the PsyToolKit-hosted n-back task was sent via the chat. Participants viewed the instructions and engaged in one block of 25 practice trials. Feedback on both speed and accuracy were delivered after the practice block. Participants then completed two
blocks of 25 trials, receiving feedback on accuracy after each. At the conclusion of the final trial block, participants were reminded to return to the Zoom room, and to use the “Raise Hand” function to indicate completion of the n-back task.

The researcher introduced the lecture segment and instructed participants to simply listen. The researcher delivered the scripted lecture. In the Moderate Chat and Heavy Chat conditions, the actors used the chat to provide their scripted input. At the conclusion of the lecture, participants were asked if they had any questions about the material.

Participants were sent a link to a final Qualtrics survey, which contained the JOL questionnaire, the Distraction Estimate Questionnaire, and the Comprehension Assessment Questionnaire. Participants returned to the Zoom room and used the “Raise Hand” function to indicate completion. Participants were thanked for their time and were dismissed. The Zoom session ended, and the recording of the session was saved.

In counterbalanced sessions, participants followed these same steps, but completed the initial round of self-report measures (including the demographic questions and the Digital Learning and Experiences assessment) at the end of the session after the final comprehension test. Counterbalancing was implemented to account for the potential influence of participants’ experiences in the current experimental session on their Digital Learning and Experiences responses.

Results

Chat-Based Disruption Does Not Affect Test Performance, Even When Controlling for Other Distractors

To test H1, that comprehension of lecture content will be affected by exposure to chat activity and that working memory capacity and external distractors may have an impact on this relationship, a one-way Analysis of Covariance (ANCOVA) was conducted with working memory capacity and metacognitive awareness of distractions as covariates. The one-way ANCOVA indicates that the frequency of chat-based disruption in an online learning environment does not affect comprehension and retention of lecture content, even when considering the impact of working memory capacity and awareness of other distractions during the testing session, \(F(2, 84) = .963, p = .386\). Levene’s Test for equality of error variances was conducted and the assumption was met, \(F(2, 84) = 1.308, p = .276\). The first covariate, working memory capacity, was not significantly related to comprehension test score, \(F(1,84) = 3.42, p = .068\). The second covariate, awareness of distractions, significantly impacted participants’ scores on the comprehension test, \(F(1,84) = 6.07, p = .016\). Once participants’ awareness of distractions was controlled for, there was no significant effect of chat frequency on test scores. Estimated marginal means, reflective of average comprehension score when controlling for covariates, are displayed in Figure 2.
This suggests that topically-relevant text messages delivered throughout a lecture do not detract from students’ ability to learn the target material. In contradiction to Mayer and Moreno (2003), we demonstrate that student learning in online environments is not necessarily sensitive to contemporaneous presentation of relevant incidental information. All means and standard deviations for the three components of the comprehension test (free recall, aided recall, and recognition) are presented alongside the total comprehension test score in Table 3.

### Table 3. Means and standard deviations for comprehension assessment by chat condition.

<table>
<thead>
<tr>
<th>Variable</th>
<th>No Chat</th>
<th>Moderate Chat</th>
<th>Heavy Chat</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Total Score</td>
<td>13.88</td>
<td>4.37</td>
<td>14.43</td>
</tr>
<tr>
<td>Free Recall</td>
<td>2.59</td>
<td>2.69</td>
<td>3.07</td>
</tr>
<tr>
<td>Aided Recall</td>
<td>4.22</td>
<td>1.96</td>
<td>4.50</td>
</tr>
<tr>
<td>Recognition</td>
<td>7.06</td>
<td>1.41</td>
<td>6.86</td>
</tr>
</tbody>
</table>

**Chat-Based Disruptions Improve Confidence in Learning When Adjusting for Other Distractions**

To evaluate H2, the effect of chat-based disruption on JOLs while accounting for awareness and perceived frequency of other distractions, a one-way ANCOVA was used. Levene’s Test for equality of error variances was conducted and the assumption was met ($F(2,86) = 2.483$, $p = .089$).

Participants’ metacognitive awareness of their own level of distraction significantly affected JOLs, $F(1, 84) = 14.359$, $p < .001$. Participants’ reports of frequency of these distractions also
significantly impacted JOLs, \( F(1, 84) = 4.024, p = .048 \). When accounting for both the awareness and frequency of distraction, frequency of chat-based disruption still impacted participants’ JOLs, \( F(2, 84) = 3.587, p = .032, \eta^2_p = .078 \) (Figure 3).

![Figure 3. Estimated marginal means of Overall JOLs by chat condition.](image)

**Chat Frequency Condition**

Pairwise comparisons of estimated means with a Bonferroni adjustment for multiple comparisons revealed that participants report significantly more confidence in learning when exposed to a moderate level of chat activity (Moderate Chat) than when the chat is not used at all (No Chat), \( p = .029 \). JOLs provided by participants assigned to the Heavy Chat condition did not differ significantly from JOLs provided by participants in the Moderate Chat condition (\( p = .977 \)) or the No Chat condition (\( p = .351 \)). Means and standard deviations for all JOL sub-scales are displayed in Table 4.

<table>
<thead>
<tr>
<th>Variable</th>
<th>No Chat</th>
<th>Moderate Chat</th>
<th>Heavy Chat</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Overall JOL</td>
<td>6.09</td>
<td>2.01</td>
<td>6.57</td>
</tr>
<tr>
<td>Multiple Choice</td>
<td>5.50</td>
<td>1.72</td>
<td>6.57</td>
</tr>
<tr>
<td>Free Recall</td>
<td>5.66</td>
<td>1.91</td>
<td>6.00</td>
</tr>
<tr>
<td>Aided Recall</td>
<td>4.63</td>
<td>2.04</td>
<td>5.04</td>
</tr>
<tr>
<td>Recognition</td>
<td>4.59</td>
<td>2.28</td>
<td>5.04</td>
</tr>
</tbody>
</table>

**Accuracy of JOLs Is Not Affected by Chat-Based Distraction**
Finally, to test H3, whether students’ abilities to accurately assess their own performance was influenced by chat disruption, correlations and correlation comparisons were conducted. The correlations between Overall JOL and Total Comprehension Test Score were computed for the No Chat \( r = .443, p = .011 \), Moderate Chat \( r = .093, p = .637 \) and Heavy Chat conditions \( r = .381, p = .042 \). JOLs produced by participants in the Moderate Chat condition were not significantly correlated with performance, whereas participants in the No Chat and Heavy Chat conditions reported JOLs that were significantly correlated with their actual test performance, suggesting greater accuracy of JOLs.

Fisher’s \( r \)-to-\( z \) transformations were used to compare the relative strengths of these correlations between JOLs and test performance. Similar to findings presented by Blasiman et al. (2018), we found that JOL accuracy was not compromised by the presence of distractors. Specifically, there were no significant differences in the accuracy of JOLs across levels of distraction (Table 5).

### Table 5. JOL Accuracy by Chat Disruption Level.

<table>
<thead>
<tr>
<th>Comparison</th>
<th>( r ) 1</th>
<th>( r ) 2</th>
<th>( z )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Chat (1) vs. Moderate Chat (2)</td>
<td>.443</td>
<td>.093</td>
<td>1.40</td>
<td>.08</td>
</tr>
<tr>
<td>No Chat (1) vs. Heavy Chat (2)</td>
<td>.443</td>
<td>.381</td>
<td>0.28</td>
<td>.39</td>
</tr>
<tr>
<td>Moderate Chat (1) vs. Heavy Chat (2)</td>
<td>.093</td>
<td>.381</td>
<td>1.1</td>
<td>.13</td>
</tr>
</tbody>
</table>

### Relationships Between Digital Learning and Experiences, Comprehension Test Performance, and JOLs

Given that the widespread adoption of video conferencing tools in educational settings, we seized the opportunity to understand how individual differences in digital learning and experiences are linked to JOLs and learning outcomes. To explore the relationship between participants’ opinions and beliefs about computer-mediated learning, distractions, JOLs, and comprehension of lecture material, a series of exploratory bivariate correlations were conducted. All correlations are displayed in Table 6.

### Table 6. Correlations for JOLs, Comprehension Test Performance, and Digital Learning & Experiences.

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. DWSQ - Prevalence</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. DWSQ – Impact</td>
<td>-.049</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Preference – Zoom</td>
<td>-.044</td>
<td>-.054</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Preference – Zoom Chat</td>
<td>-.209*</td>
<td>-.017</td>
<td>.200</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Perceptions of Online Learning</td>
<td>.077</td>
<td>.018</td>
<td>.704**</td>
<td>.167</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. CMCA</td>
<td>.150</td>
<td>.051</td>
<td>-.571**</td>
<td>-.298**</td>
<td>-.576**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Overall JOL</td>
<td>.113</td>
<td>.068</td>
<td>.352**</td>
<td>.201</td>
<td>.380**</td>
<td>-.193</td>
<td></td>
</tr>
<tr>
<td>8. Total Comprehension Score</td>
<td>-.085</td>
<td>-.047</td>
<td>.262*</td>
<td>.072</td>
<td>.278**</td>
<td>-.122</td>
<td>.318**</td>
</tr>
</tbody>
</table>

* \( p < .05 \), ** \( p < .01 \)

Overall JOLs were positively correlated with positive attitudes toward online learning \( r = .38, p < .001 \) and use of Zoom \( r = .352, p = .001 \). Overall comprehension test performance was also positively correlated with positive attitudes toward online learning \( r = .278, p = .008 \) and positive attitudes toward the use of Zoom \( r = .262, p = .013 \). Computer Mediated Communication Apprehension (CMCA) was negatively correlated with preferences for Zoom \( r = -.571, p < .001 \),
Zoom chat ($r = -.298, p = .008$), and online learning ($r = -.576, p < .001$). These correlations hint at the possibility of strong, consistent dispositional beliefs about online learning that can contribute to differences in confidence in learned material as well as performance on assessments.

**General Discussion**

The aim of this study was to evaluate the impact of text-based chat interruptions on comprehension and learner confidence in an online lecture environment. Findings from this study indicate that increasingly frequent chat from peers in a synchronous online lecture environment does not serve as a significant distractor. Contrary to existing findings (Barks et al., 2011; Blasiman et al., 2018; Dietz & Henrich, 2014; Gingerich & Lineweaver, 2013), exposure to these text-based interjections does not detract from students’ ability to learn and master lecture content. When considering the already noisy environment students are often immersed in as they learn in these online spaces, it is possible that the effect of chat disruption is simply drowned out by the effects of other distractors students experience at the same time (e.g. listening to music, socializing, watching tv, social networking). However, when controlling for participants’ other self-reported distraction experiences and their working memory capacity, we find that test performance is unaffected by chat input, which echoes existing findings regarding text messaging and learning (Dietz & Henrich, 2014). Put simply, interruption via chat activity isn’t distracting enough to affect learning. These findings strike a contrast with the framework posited by Mayer and Moreno (2003), who initially suggest that the cognitive load associated with multimedia learning can be taxed through the introduction of incidental (i.e. extraneous and seemingly unnecessary) information. In this study, we show that the introduction of incidental information does not introduce enough distraction to affect learning.

Instead, the current study demonstrates that incidental information can boost confidence in learned material. When controlling for outside distractions, participants in this study showed a significant increase in JOLs when exposed to moderate levels of topic-relevant chat in concert with the lecture when compared to participants who were not exposed to topic-relevant chat content. The predictive accuracy of JOLs did not differ based on the frequency of chat activity, indicating that the impact of chat is relegated specifically to students’ perceptions of learning. To phrase in terms of Mayer and Moreno’s (2003) work, the incidental information available via moderately frequent chat can support students’ confidence in learning the essential information presented in the lecture. This incidental information does not need to be deliberately integrated into the learning environment; in the current study, the lecturer does not engage with or acknowledge the chat content. The chat serves as a separate stream of topically-related incidental information provided by peers, and does not require effortful incorporation into the essential information. In short, the leveraging of embedded chat functions in online learning environments is not harmful for learning, is extremely easy for participants to use, and can build confidence in the essential information without involvement from the lecturer.

These findings exist in clear contrast with the existing literature on the detrimental effects of text messaging and learning. How is it possible that exposure to more information in an online learning environment can have no detrimental effect on learning and can, in some cases, facilitate increased confidence in learned material? One potential explanation for these findings is that participants find chat engaging in an otherwise unengaging and isolated lecture environment. During lecture sessions, students are expected to remain engaged by leveraging sustained attention. However, this degree of engagement is difficult to maintain for an extended period of time, and can lead to increased instances of mind wandering and distraction (Risko et al., 2011; Szpunar et al., 2013a, Szpunar et al., 2013b). The increased exposure to topically relevant information may serve to keep students engaged in the material and in the digital lecture space, much like interpolated testing has been shown to do (Szpunar et al., 2013a).
It is also possible that exposure to topically-relevant chat in small doses is helpful in reinforcing concepts covered in the lecture. The substance of the chat itself may not be sufficient to bolster learning, but could serve as confirmation that the students are understanding the essential information in real time. Peer support has been shown to increase learning confidence in contexts such as teacher education (Prince et al., 2010), computer science (Packard et al., 2020), and nursing education (Gray et al., 2019). Leveraging existing digital space to allow for the exchange of examples and information among peers without added involvement from the instructor may reduce uncertainty and elevate confidence without significantly taxing students’ cognitive load.

Despite extensive research showing the predictive value of WMC on performance in cognitively demanding environments, findings from the current study do not show any effect of WMC on comprehension outcomes across levels of distraction. Although WMC is usually an excellent predictor of a person’s ability to manage distractions and allocate attention, a growing collection of research has demonstrated evidence to the contrary. In a meta-analysis of several WMC studies, Sörqvist and colleagues (2017) demonstrate that individual differences in WMC may not predict the ability to handle varying levels of distracting information, particularly in contexts where visual and verbal tasks are competing for resources. The lack of effect of WMC on comprehension outcomes in the current study may provide an additional piece of evidence to support this new perspective. It is also possible that instead of relying on executive functions to mitigate the effects of ever-present disruptions, students have developed effective strategies to manage distractions in online learning environments, such as closing the chat window or disabling notifications. By strategically offloading this attentionally demanding task, distraction management would require fewer cognitive resources, reducing the potential impact of individual differences in WMC on task performance outcomes. Ball and colleagues (2021) have shown that the impacts of WMC on task performance outcomes are eliminated when students are encouraged to use offloading strategies. Although it is initially surprising that WMC does not seem to play a role in the relationship between distraction and comprehension, this null relationship presents some interesting opportunities for future research regarding strategic management of distractions during the learning process.

**Future Directions & Limitations**

The current study explores one specific instance of chat use in an online learning environment. Given the novelty and increased popularity of these platforms, a number of questions still remain. Certainly, it’s important to confirm the impact of topically-irrelevant chat on learning outcomes and JOLs, in line with the existing literature on text messaging and learning (Barks et al., 2011; Chen & Yan, 2016; Dietz & Henrich, 2014; Gingerich & Lineweaver, 2013). In addition, an exploration of the effects of lecturer engagement with the contents of the chat could begin to bridge the gap between what is considered essential and what is considered incidental information in an integrated online learning platform (Mayer & Moreno, 2003). If the instructor acknowledges and incorporates useful chat information into the lecture, this may blur the line between essential and incidental information, further clarifying the boundaries of a coherence effect (Mayer & Moreno, 2003). Finally, as previously mentioned with regard to the impact of WMC, investigation into student strategies for managing incoming chat information may shed light on the individual differences at play in online learning spaces. Although the vast majority of participants in the current study were aware of the chat contents, some participants may exercise strategies to avoid interruptions in an attempt to regulate focus on the task at hand. Understanding these strategic forms of distraction management may allow educators and other users of online meeting interfaces to encourage and support successful attention regulation.

Future research may also target the limitations of the current research and attempt to address some of the shortcomings of the current study design. In the current study, the lecture portion lasts
for less than 10 minutes. The brevity of the lecture is not reflective of the lengthier lectures that are common in college courses. Because the lecture portion was not long-lasting, students may have encountered fewer difficulties with maintaining attention than they would for a lengthier lecture (Ravizza et al., 2017). Additional research may evaluate the effects of distraction in online learning environments over a longer period of time. The role of the instructor as director of attention is also largely omitted in the current study. Instead of drawing attention to the chat window by addressing chat activity and answering questions, the instructor in the current study does not deliberately acknowledge or incorporate chat contents into the learning session. Future research may aim to investigate the effects of effortful incorporation of these multimedia learning components on the part of the instructor. By further evaluating the impacts of capitalizing on extraneous information (e.g. chat contents) in an online learning environment, recommendations for best practices in synchronous online teaching can be developed with the goal of leveraging the power of these online tools to improve student learning.

Conclusion

Despite initial apprehensions about the ample opportunities for distraction in online learning environments, the current study shows that the use of the chat function for topically relevant chat is not harmful for learning. Moderate amounts of relevant chat from peers can bolster confidence in learned material, even when the contents of the chat are unacknowledged by the lecturer, and even when the learners themselves are not actively participating in the chat. These findings present an exciting opportunity for educators to support student confidence during the learning of tough concepts. Providing supportive examples in adjacent modalities and highlighting the usefulness of these concurrent information streams can encourage students to continue engaging in the target material. Instead of viewing these features as distractors and ultimately attempting to minimize their use, teachers can use simple prompts to leverage these integrated features to improve student outcomes. The small practice of taking a simple pause to remind students to “drop an example in the chat!” may be enough of a nudge for students to engage with adjacent learning opportunities, and an opportunity for instructors to take a small step toward embracing peer-led text chat as a learning tool rather than an attentional liability.

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Appendix

Appendix 1. Lecture Script.
Language is the mechanism by which humans communicate. We use language to exchange information, express thoughts and discuss ideas.

When we think of language, most of the time we think of phrases or sentences. Languages can be studied at a number of different levels. Phrases and sentences sit in the middle of the spectrum in
terms of size. If we investigate smaller pieces of language, we can consider the individual sounds that make up a language. If we investigate the largest levels of language, we can think about a speaker's intent when uttering a sentence or paragraph (like in situations where you'd use sarcasm). Let's go through the units or levels of spoken language from smallest [M1], [H1] to largest. Signed languages like American Sign Language share most of these attributes, but can differ slightly in some places, so we'll stick to talking about spoken languages.

The smallest unit of spoken language is a phoneme. A phoneme is a fundamental unit of sound. Each word is made up of one or more phonemes. For example, the word dog contains three phonemes, /d/, /o/ and /g/. There are three distinct sounds. This should not be confused with the number of letters in a word. In many cases, one phoneme is represented by several letters. For example, the word “three” has three phonemes. The /th/ is one sound unit. It can’t be broken down any further. The /r/ is a second sound unit, and the long /e/ is a third, even though it’s spelled with two letters. So the word “three” is spelled with five letters, but only uses three phonemes, or fundamental sound units [H2].

Each language differs in terms of the number of phonemes it’s made of. North American Spoken English contains approximately 42 phonemes, which means that the entirety of our spoken linguistic system is made up of a little over 40 sounds. When we consider the complexity of spoken language, it’s pretty remarkable that everything we have to say can be broken down into these few pieces. Other linguistic systems are comprised of different numbers and kinds of phonemes. Some linguistic systems have far more phonemes than North American English. For example, Taa, a language spoken by many people in Botswana and Namibia, contains about 140 phonemes, including five distinctive types of clicks. Other linguistic systems are comprised of far fewer phonemes, like Hawaiian, which is made of approximately 13 sound units.

To recap, all spoken languages are comprise of a specific set of phonemes, or sound units. These sound units are different from the letters required to spell each word, and really have to do with what sounds are required for a speaker to produce the language. These phonemes can vary dramatically between languages.

On their own, phonemes do not necessarily mean anything. For example, the “th” phoneme doesn’t carry informative meaning by itself. This takes us to the next level of spoken language, which is the meaning unit. Morphemes are the smallest unit of meaning in a language. Each morpheme is made of one or more phonemes, and carries meaning on its own. Morphemes can be root words like “cook” [M2], [H3], which is definable by itself. It can’t be broken down into smaller parts and still retain the same meaning. Morphemes can also be prefixes or suffixes, like “un-” or “-ed” [H4]. We can define “un-” and “-ed” without having to attach them to a root word. “un-“ means “not” and “-ed” refers to something that has already happened. These affixes have meaning on their own, but aren’t standalone words. Morphemes can be combined to layer complex meanings. For example, the word “uncooked” is made of 3 of morphemes: /un/, /cook/ and /ed/.

Our minds need to hold representations of all of these morphemes and phonemes, as well as the rules for how to appropriately put morphemes together to make meaningful words. All of this information is stored in your mental lexicon. You can think of the mental lexicon as combination between a dictionary and a concept map. The morphemes in your vocabulary are stored here in close proximity to other morphemes that sound the same. For example, morphemes cat, bat, sat, hat and mat are all clustered together in your mental lexicon because they sound similar. The morphemes in your mental
lexicon are also organized by meaning. Your mental lexicon likely represents the morpheme doctor alongside nurse, surgery, medical, and health because all of those morphemes have meaningful relationships with one another. Because your mental lexicon stores all of your morphemes and the rules for putting them together, you are able to stick several morphemes together to make meaningful words on the fly. Instead of storing “tie”, “untie”, “untied” and “untying” as separate items, you store “tie” as one morpheme, the prefix “un-” as another, and the suffixes “-ed” and “-ing” as two other morphemes. All of these items hold meaning on their own, and you know the rules required to string them together appropriately to create words. Think about how much information needs to be stored in the mental lexicon. Every meaningful linguistic unit in your vocabulary lives here. In your head, try and estimate how many morphemes exist in the average adult English speaker’s mental lexicon. The answer is about 80,000 morphemes. Everything you communicate through language is encoded in these 80,000 linguistic building blocks.

If we move beyond morphemes and step a few levels up, we can start to investigate the meaning of linguistic components. If we focus on word meaning, we are thinking about something called semantics. Semantics can refer to a word’s “textbook definition”. For example, a “skyline” refers to a view of a horizon. However, this textbook definition can vary from the way that the word is conventionally used. We don’t typically use the term “skyline” to refer to all horizon views. Instead, we usually reserve this term for city landscapes (for example, the Chicago skyline). So “skyline” technically means one thing, but in reality means another. One remarkable thing about semantics is that they can and do change dramatically over time. Words that were once used in one way (and that mean one specific thing in a dictionary sense) can be adopted for use in a completely different way, and language users generally just agree that this is okay. This is called a semantic shift or semantic change. Take the term “literally”. “Literally”, in a dictionary definition sense means absolutely, directly, or exactly. Over time, the meaning of “literally” has shifted, and now it gets used as an exaggeration, or to mean the exact opposite of its original definition. It’s not uncommon to hear someone say “I literally died after I walked up those three flights of stairs”, and to understand that the meaning behind that statement is that the person was really tired by the time they finished climbing the stairs. Even though some sticklers for language will try to correct people when they use “literally” in the figurative sense, most speakers of a language will ultimately agree on the new, intended meaning. As a result, the semantic nature of the term changes! Other contemporary examples include the term “lit” and “dead”. When used in casual conversation, “lit” and “dead” don’t mean “on fire” and “deceased”, respectively. Instead, “lit” is used to indicate that something is exciting or intense, and “dead” can be used to refer to a response to something particularly funny or outrageous (as if you died laughing).

Semantic shift is one really common example of how language can change gradually over time. Another important example of language change is the development of brand new words. Language is dynamic, which means it has to grow, change and adapt to accommodate new phenomena. When we come up with these new words to refer to these new things, we are developing neologisms. It’s important to note that a neologism is made up of existing morphemes to create a new meaningful word or phrase, but is different from semantic shift, where an existing word takes on a new meaning. So the components are old but the word is new! One example of a neologism is the term “staycation”, which combines the terms “stay” and “vacation” to create a new word to reflect a vacation that is taken without straying far from home. A staycation might involve a day trip to a local theme park, or a fort-building contest in the back yard, or an at-home spa day. Staycations have become commonplace, and families may find themselves being less inclined to make a big vacation trip to some far-off destination. With these behaviors on the rise, we needed a concise term
to refer to them. And thus, “staycation” was born! Another very timely example of a new word that reflects current events is “doomsscrolling”. Doomsscrolling refers to a social media behavior whereby a person gets stuck in a pattern of scrolling through a feed in shock or horror as a result of a substantial amount of negative news or information. Doomsscrolling didn’t exist as a word in 1850 because it wasn’t necessary and wouldn’t have reflected anything meaningful. The ability to scroll through social media, and the increase in bad, sad news has motivated the creation and development of this new word. Overall, what we see with semantic shift and neologisms is that language has an important job in expanding and modifying to accommodate new phenomena and cultural practices.

Overall, what we’ve seen here is that language has many levels at which it can be understood. These range from individual sounds you produce as you utter a word all the way up to the intended meaning behind a specific word or phrase. We know that language has evolved dramatically over past centuries, and it will certainly be interesting to see how linguistic systems change in the future.

Note: Bracketed notations within the lecture script represent where chat script interleaves. [H1], [H2], etc. represent the interjection points in the heavy chat condition. [M1], [M2], etc. represent the interjection points in the moderate chat condition. Interjection points represent a paired interjections rather than individual interjections. See Appendix 2 for chat script.

Appendix 2. Heavy and Moderate Chat Scripts.

[H1, M1] Actor 2: I think the smallest unit would be individual letters
   Actor 1: I think it’s sounds

[H2] Actor 1: So the word ship has 3 phonemes and book would have 4?
   Actor 2: Ship and book would both have 3 phonemes. Ship= sh, i, p and Book= b, oo, k
   Actor 1: Oh okay because /sh/ and /oo/ are phonemes, that makes sense!

[H3, M2] Actor 2: What’s another example of a morpheme?
   Actor 1: I think like would be considered a morpheme
   Actor 2: Thank you!

[H4] Actor 1: is "de-" a morpheme? Like "decontaminate"?
   Actor 2: I think so, like it would mean "to undo something"

[H5, M3] Actor 2: 2,000?
   Actor 1: 35,000?

[H6] Actor 2: So the term basic would be considered a semantic shift? Since the textbook definition is fundamental or simple but now people will say "that’s so basic?"
   Actor 1: Like pumpkin spice lattes?

[H7] Actor 1: Would highkey and lowkey be an example of this?
   Actor 2: Hmm I think so!

[H8, M4] Actor 2: How about a coronacation?
   Actor 1: What is coronacation?
   Actor 2: It’s when someone takes advantage of cheap travel because of coronavirus.

The chat labels [H] are the chat interjections presented in the Heavy Chat condition. The chat labels [M] are the chat interjections presented in the Moderate Chat condition. The specific location of each chat interjection can be seen in Appendix A.
Appendix 3. Judgments of Learning Questionnaire.

Based on questions used by Blasiman et al., 2018
For the following questions, please rate your confidence levels on a scale of 1-10, 1 indicating a low level of confidence and 10 indicating a high level of confidence.

Rate how confident you feel that you learned the information presented in the lecture on language.

Rate the level of confidence you have in being able to correctly answer a multiple choice question about this lecture.

Rate the level of confidence you have in being able to recognize material that was not present in the lecture.

Rate the level of confidence you have in being able to correctly list topics that were discussed in the lecture.

Rate the level of confidence you have in being able to complete fill-in-the-blank questions for content presented in the lecture.

Appendix 4. Distraction Estimate Inventory.

Metacognitive Awareness of Distraction Subscale
For the following questions, consider the language lecture you just listened to. Please answer each question honestly. There are no right or wrong answers. Rate your agreement with each statement using the following scale:

Strongly disagree
Somewhat disagree
Neither disagree nor agree
Somewhat agree
Strongly agree

During the lecture, I felt very distracted.
During the lecture, I did not find it hard to focus on the information being presented to me.*
During the lecture, the chat interrupted my concentration.
During the lecture, I found myself not listening to the speaker.
During the lecture, I was very focused on the professor.*
During the lecture, I was also completing other tasks.
During the lecture, I did not engage in other activities.
During the lecture, I found it easy to remain focused on the speaker.*

Distraction Frequency Estimates Subscale
For the following questions, consider the language lecture you just listened to. Please answer each question honestly. There are no right or wrong answers. Rate your agreement with each statement using the following scale:

Most of the time
Some of the time
A little of the time
During the lecture, I used my cell phone for reasons unrelated to the Zoom session.
During the lecture, I had a conversation with another person not participating in the Zoom session.
During the lecture, I did not use my computer for reasons unrelated to the Zoom session.*
During the lecture, I stayed focused on the content of the lecture.*
During the lecture, I did not engage in other tasks.*

* Item was reverse scored.

Appendix 5. Lecture Comprehension Assessment.

Based on method used by Srivastava et al. (2013)

For the following questions, consider the language lecture you just listened to. Please answer the questions to the best of your ability.

Lecture Content Questions

Free Recall Instructions: Write down as much information as you are able to remember from the lecture you just heard. You may use bullet points, sentences, phrases, and lists.

Aided Recall Instructions: For the following questions, you will be asked to complete several different sentences with the appropriate word pertaining to the language lecture. Please complete the sentence to the best of your ability.

(Note: Italicized, underlined items indicate target items. These are the correct answers)

We use language to exchange information, express thoughts and discuss ideas.
The smallest unit of spoken language is called a phoneme.
The smallest unit of meaning in a spoken language is called a morpheme.
Suffixes like “-ed” and prefixes like “un-” are considered to be morphemes.
Taa, the language spoken in regions of Africa, has phonemes that include five different types of tongue clicks.
New words that get added to a language system (such as “staycation”) are called neologisms.
Semantic shift is when an existing word takes on a new meaning/definition.
The word “unhelpfulness” contains four morphemes.
Each person’s mental dictionary, which contains their entire vocabulary, is called the mental lexicon.
The mental lexicon of an adult English speaker contains approximately 80,000 morphemes.

Recognition Instructions: For each statement, determine whether or not this information was presented in the lecture. For each statement, select whether this or specific example was delivered by the lecturer, or was not delivered by the lecturer. Please answer each question to the best of your ability.

Note: * indicates a false target. This information was not presented by the lecturer)

The morphemes in your vocabulary are mentally stored in close proximity to other morphemes that sound the same.
The morphemes in your mental lexicon are organized by meaning. The morphemes in your mental lexicon are organized alphabetically.*
North American Spoken English contains approximately 42 phonemes.
North American Spoken English contains approximately 13 phonemes.*
North American Spoken English contains approximately 140 phonemes.*
Taa, a language spoken by many people in Botswana and Namibia, contains about 140 phonemes.
The word uncooked contains three phonemes.
One example of a neologism is “doomscrolling.”
One example of a neologism is “lit”.*
Using “literally” to mean “figuratively” is an example of semantic shift.
Semantics of a word can change if enough people agree on the new meaning and start using it.
Semantic shift and neologisms exist in language because people are not good at learning definitions of words.*
Semantic shift and neologisms exist in language to accommodate new phenomena and cultural practices.

Chat Content Questions

Free Recall Instructions: Write down as much information as you are able to remember from the chat, if there was any, that occurred during the lecture you just heard. You may use bullet points, sentences, phrases, and lists.

Recognition Questions
(These items were interspersed in the Lecture Content - Recognition assessment)
An adult English speaker’s mental lexicon contains approximately 2000 morphemes.*
An adult English speaker’s mental lexicon contains approximately 35000 morphemes.*
Individual letters are the smallest unit of language. *
One example of a neologism is “Coronacation”.*
Two examples of neologisms are “highkey” and “lowkey”.**
The word “ship” contains three phonemes.*
The word “book” contains three phonemes.*
The word “basic” has undergone a semantic shift.**
The word “like” is a morpheme.*
The “de-” in “decontaminate” is a morpheme.**

* Only present in the Moderate & Heavy Chat conditions
** Only present for the Heavy Chat condition.
Appendix 6. Zoom Chat Tendencies Questionnaire.

The following questions ask about your opinions and typical use of Zoom functions. Consider your experiences with Zoom as you answer these questions.

Do you use the chat function during Zoom sessions?
- No
- Sometimes
- Yes

For the following question, please check all of the boxes that apply to you.
When are you most likely to use the chat function?
- To get clarification
- To ask a question
- To provide my opinion
- When I am told to
- To introduce myself
- To speak to a peer
- Never

How often do you use the chat function on Zoom?
- Never
- A little of the time
- Some of the time
- Most of the time

How often do you use Zoom?
- Never
- Sometimes
- A lot of times

Do you prefer the whole group chat function, one-on-one chat function, or mobile texting on a separate device?

Open-Ended
For what reasons (if any) do you use the chat function?

For what reasons (if any) do you not use the chat function?
References


Reflecting on Professional Development Opportunities: 
Links Between Conceptions of Mathematics Graduate Teaching 
Assistants and Their Self-Efficacy

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Abstract: This study examines the perceptions of first-year, mathematics graduate teaching assistants (GTAs) participating in a six-week summer course designed to deepen their knowledge of collegiate mathematics teaching practices before being assigned to instruct undergraduate students in the subsequent fall semester. Through hybrid deductive-inductive thematic analysis, GTAs’ written reflections were analyzed and matched against changes in their self-efficacy assessed along two conceptual dimensions: self-improvement and stimulation of student learning. Results suggest that GTAs’ conceptualization of teaching practice informs changes in self-efficacy along both conceptual dimensions, with efficacy in self-improvement changing more than that of their ability to stimulate student learning. Therefore, the strength of the efficacy changes may be moderated by features of the professional development course. We explore defining features of the professional development course employed in this study, describing implications for the education and development of novice collegiate mathematics instructors, and the potential to optimize change along both conceptual dimensions of self-efficacy.

Keywords: Micro-teaching, Written Reflections, Deductive Coding, Inductive Coding

Introduction and Literature Review

Improving the quality of teaching instruction in higher education begins with the preparation of graduate teaching assistants (GTAs). This is especially critical in the common situation where GTAs have responsibility for teaching many of the lower-division undergraduate mathematics courses (Deshler et al., 2015; Speer et al., 2005). Such preparation provides first-time teaching experience for GTAs and may in fact be the only formal pedagogical training that they receive throughout their careers (Luft et al., 2004; Tanner & Allen, 2006). Adoption of effective pedagogical practices during this early induction phase of GTAs is thus critical support in the development of teaching effectiveness of future faculty (Gilmore et al., 2014). There is considerable evidence of a substantial relationship between teaching effectiveness and self-efficacy (Klassen & Tze, 2014; Rockoff et al., 2011), and that this relationship is a reciprocal one (Holzberger et al. 2013). Moreover, despite the pressing need for effective induction of GTAs, we know little about the way in which development opportunities contribute to their teaching effectiveness (Gilmore et al., 2014). Consequently, just how these opportunities influence the self-efficacy of GTAs is unclear. Given the likely reciprocity between teaching effectiveness and self-efficacy (Holzberger et al. 2013), examining the factors which contribute to GTAs’ self-efficacy is a wide-reaching research and policy priority, impacting the induction and development of GTAs in the near-term, and the teaching effectiveness of faculty in the
longer term (Klassen & Tze, 2008). The current study examines the perceptions of GTAs participating in a summer course designed to deepen their knowledge of collegiate mathematics teaching practices before being assigned to instruct undergraduate students the subsequent fall semester. Specifically, we employ reflective writing to explore how GTAs’ summer course micro-teaching experiences influence belief in their ability to meet the instructional challenges ahead.

Research on the impact of GTAs’ professional development opportunities is vital during this time of increased attention to the quality of undergraduate mathematics instruction. This attention stems from the recent trend that places graduate teaching assistants in the position of primary instructors (Weidert et al., 2012). As such, GTAs are expected to be experts in the field and possess the pedagogical skills of a fully-fledged instructor. Yet in many instances, GTAs lack pedagogical training, highlighting an important area for professional development considering GTAs’ teaching effectiveness. One factor contributing to teacher effectiveness is self-efficacy (Woolfolk & Shaughnessy, 2004). Self-efficacy, or the degree to which people estimate their capacity to execute behaviors necessary to produce certain outcomes, has long been hypothesized to be a strong mediating factor in teacher effectiveness. According to Denham and Michael’s conceptual model, a heightened sense of self-efficacy should affect teachers’ perceived and actual abilities to teach more effectively (Denham & Michael, 1981). Greater efficacy leads to an enhanced self-belief and better visualization of success scenarios, factors which are equally important as the actual possession of these skills, and which lead in turn to better performance and greater efficacy (Bandura, 1993). Whereas earlier work focused on the impact of teachers’ self-efficacy beliefs on instructional behavior or student outcomes (Caprara et al., 2006), more recent work treats teachers’ self-efficacy as an outcome of their educational processes (DeChenne et al., 2017; Yoo, 2016). In this study, we applied Bandura’s social cognitive theory to explore factors underlying the development of teaching efficacy in GTAs (Bandura, 1988; Komarraju, 2008).

**Theoretical Background**

According to Bandura’s social cognitive theory, self-efficacy beliefs rest on four sources: mastery experience, vicarious experience, verbal persuasion, and physiological feedback (Bandura, 1988; Holzberger et al., 2013). Mastery experience involves teaching events that allow for both failures and opportunities to overcome them; vicarious experience provides opportunities to observe the performance of peers with whom one can identify; verbal persuasion arises from the social circle of family and friends that surround a person; and physiological feedback derives from the anxiety of undertaking a challenging task and the relief of overcoming it (Komarraju, 2008). Prior research on the impact of induction phases on GTAs’ teaching self-efficacy has generated mixed results. These range from evidence showing high impact of professional development on GTAs’ teaching efficacy (Burton et al., 2005; Komarraju, 2008; Meyers et al., 2007; Young & Bippus 2008), to no impact at all (Prieto & Altmayer, 1994; Tollerud, 1991). At the same time, research on instructional quality clearly demonstrates that teachers draw inferences from their instructional quality and modify their efficacy beliefs accordingly (Brouwers & Tomic, 2000; Caprara et al., 2006; Holzberger et al., 2013). We propose that the contradictory results regarding the impact of the induction phase on GTAs’ self-efficacy is attributable to shortfalls in the experience and feedback opportunities which shape GTAs' emerging self-efficacy beliefs. Clarifying the inputs to this construct will do much to reconcile variation in research outcomes.

Inputs to self-efficacy beliefs lead to functional outcomes that are captured within the affective, cognitive, motivational and selection domains (Bandura, 1993): that is, feelings of confidence (if self-

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1 *Domains* represent categories of functioning that facilitate dynamic interchange between humans and environment in shaping self-efficacy.
efficacy is high) or insecurity (if self-efficacy is low) are related to the affective domain. An individual’s self-evaluation of their ability to set goals and be successful are self-efficacy beliefs within the cognitive domain; motivational, relating to an individual's persistence in achieving goals; and selection, where an individual chooses to actively pursue or avoid situations based on their perceived likelihood of success or failure (Bandura, 1993). Thus, inquiry into GTAs’ reflections of their summer teaching opportunities in these domains of human functioning provides insight into the mechanism that shapes self-beliefs.

Identifying ways in which GTAs develop along these four domains (accessible via their reflections) provides insight into the informational sources that shape their self-efficacy (accessible via self-efficacy surveys) (Shehni et al., 2009). To minimize the self-perception bias associated with instructional self-rating available through self-reported efficacy data (Appendix 3) (Podsakoff et al., 2003), GTAs reflect in response to questions that interrogate their experiences after participating in an iterative teaching presentation process (Appendix 1 and 2). Drawing on multiple data sources in investigating the relationship between GTAs’ efficacy and conceptions of teaching approaches triangulates data sources and controls for possible method bias.

Four domains of human functioning were used to analyze GTAs’ written reflections on microteaching experiences. To relate reflection analysis to self-reported efficacy data, the former was matched against two dimensions of a self-efficacy survey instrument. These two dimensions represent theoretical concepts employed to arrange items in the self-efficacy instrument into two subscales, Instructional and Learning. Instructional Subscale items measure skills needed to prepare and teach a class whereas Learning Subscale items evaluate skills needed to stimulate student learning, Appendix 3, (DeChenne et al., 2012). Since teaching opportunities provide experiences that contribute to GTAs’ self-efficacy, we examined the extent to which domains of functioning identified in GTAs’ reflections match changes in self-efficacy ratings in both Instructional and Learning dimensions. In general, we hypothesized that the context-specificity of the teaching experience would direct GTAs’ attention to dimensions in which they may be deficient [32]. To explore how GTAs draw inferences from their iterative micro-teaching experiences to modify their self-efficacy beliefs, we posed the following three questions:

1. What is the nature of GTAs’ affective, cognitive, motivational, and selection domains as expressed in their first and the second reflections?
2. How are emerging sub-codes (sub-themes) within affective, cognitive, motivational, and selection domains correlated with one another?
3. How do emerging sub-codes explain positive or negative changes in GTAs’ self-efficacy from pre- to post-assessment?

Given that GTAs are critical agents who teach large numbers of undergraduate students, particularly incoming freshmen (Deshler et al., 2015; Speer et al., 2005), results from this research can inform the design of future exemplary programs that will have a lasting influence on GTAs’ self-efficacy construct and instructional expertise.
Methods

Participants and Contexts

The 15 participants were pursuing masters (12) and PhD (3) degrees in mathematics and statistics, and all were enrolled in a six-week professional development micro-teaching project required of all mathematics GTAs in their first year of teaching at a midwestern, rural, public institution. After this summer course, each would be assigned as an instructor of record to teach one of the following courses: College Algebra, Introductory Statistics, Quantitative Reasoning, Precalculus, or Calculus I. GTAs varied slightly in their prior exposure to teaching opportunities. Eight out of 15 GTAs had some (formal or informal) experience as tutors and one of these experienced tutors had prior experience teaching secondary mathematics before enrolling in the Master of Arts program.

Data Sources and Data Collection

The data comprised two written reflections on micro-teaching experiences and two self-efficacy survey responses. Reflection responses were submitted approximately 48 hours after completing the micro-teaching exercises, by the end of weeks 3 (Reflection 1) and week 4 (Reflection 2). This study implemented an iterative lesson study cycle with novice GTAs. First, GTAs working in small groups prepared a 50-minute lesson plan centered around measurable learning objectives. Then, each GTA partook in a micro-teaching experience presenting a 10-minute portion of their lesson to an audience that was role-played by other graduate students and faculty. Following the first micro-teaching iteration, the audience members provided GTAs with written feedback and GTAs watched a video recording of their teaching. Immediately afterwards, GTAs wrote a reflection about how, and why, they believed they achieved their goals and what changes they would make (see Appendix 1 for specific reflection questions). In the professional development course, GTAs then learned about a variety of student-centered, formative assessment techniques, of which they were required to incorporate at least one into a revised version of their lesson plan. During the revision-phase of the lesson study cycle, GTAs worked in small groups to address changes in response to micro-teaching 1 and selected formative assessment techniques aligned with the lesson goals they intended to attempt. Following the revision, each GTA taught a 15-minute portion of their lesson to a similar audience, in a second micro-teaching iteration. Likewise, they received feedback from audience members, this time including additional commentary on formative assessment strategies. Following this second iteration, each GTA again viewed the video recording and reflected on how, and why, they believed they had achieved their goals, if they thought they effectively addressed major comments from iteration one, and what they had learned from the course project overall (see Appendix 2 for specific reflection questions).

2 In this paper, we refer to *novice* GTAs as those who have taught for two semesters or fewer at this institution.

3 This stage is one of two micro-teaching components in the course project. It contrasts with traditional Lesson Study, wherein one group member teaches the entire lesson to a real group of students while the rest of the group observed and studied the lesson implementation. Instead, the audience was comprised of graduate students and faculty members. Due to time constraints and scheduling logistics, here GTAs did not teach their entire lesson but every group member got to experience teaching a predetermined, self-selected portion of the lesson, helping each novice personally consider ways to improve.

4 This slightly expanded time relative to the first iteration was to allow time to attempt one or more formative assessment techniques. Although not required to teach the exact same part of their lesson plan in this second iteration, many GTAs chose to teach a similar portion.
Data collection was complemented by self-efficacy surveys that were administered at the beginning and end of the summer program. GTAs submitted their responses to the self-efficacy survey as part of a Qualtrics “beginning-of-semester” survey due by the end of the first-class meeting (the pre-survey), and an “end-of-semester” survey, due by the end of the sixth week of class (the post-survey). To measure self-efficacy, we adopted a survey developed by DeChenne et al. (2012), based on the Graduate Teaching Assistant-Teaching Self-Efficacy Scale. The survey (Appendix 3) consisted of 18 items in two scales (1=not confident at all, 6=completely confident): Instructional- and Learning Subscales, comprising 7 and 11 items, respectively. The instructional subscale measures self-efficacy related to the concrete skills necessary to prepare and teach a class, while the learning subscale measures skills needed to overcome challenges and support student learning in the complex learning environment of an actual classroom (DeChenne et al., 2012). In the following section, we provide the coding scheme used for data analysis in more detail, before describing how data were analyzed.

Operationalization of Codes: The Coding Scheme for GTAs’ Reflections

Qualitative analysis of reflections was a two-step process incorporating a deductive approach (Miles & Huberman, 1994) with an a priori template of broad codes based on four domains of functioning (Bandura, 1993; Komarraju, 2008), and an inductive data-driven coding approach (Glaser, 1992). To deductively examine GTAs’ reflections, we drew upon Bandura’s four levels of human functioning: cognitive (individuals believe that they can set achievable goals and succeed), affective (feeling confident if self-efficacy is high or depressed if low), motivational (being able to persist in reaching a goal), and selection (choosing situations in which individuals can succeed). This deductive broad-level coding of GTAs’ reflections on micro-teaching experiences allowed us to organize narratives and subsequently inductively code for emerging sub-codes. We entered these reflections as project documents into the N-Vivo computerized data management program. With the broad codes entered as nodes (i.e., affective, cognitive, motivational, and selection), one author coded the data by selecting segments of text representative of the broad code (Table 1). A single sentence or a group of sentences connected thematically were treated as a unit of analysis while coding for broad codes.

This initial analytical step revealed potential sub-themes for which we developed a set of sub-codes within each broad code, marking the inductive coding. These sub-codes were entered as child-nodes in N-Vivo and used to match the sub-codes with the appropriate segments of text. To establish inter-rater reliability, the first and the second authors coded broad- and sub-codes for six randomly selected reflections representing 20% of the 30 reflections. Inter-rater concordance was 83% and 75% at the level of broad and sub-codes, respectively.
<table>
<thead>
<tr>
<th>Broad Codes (Bandura, 1993; Komarraju, 2008) and Emerging Sub-codes as Part of the Coding Scheme</th>
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</thead>
<tbody>
<tr>
<td><strong>Affective:</strong> GTAs' feelings &amp; self-perception (expression of self-confidence if self-efficacy is high and lack of confidence when self-efficacy is low)</td>
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<tr>
<td>Positive</td>
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<tr>
<td>Negative</td>
</tr>
<tr>
<td>Neutral</td>
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<tr>
<td><strong>Cognitive:</strong> Statements reflecting GTAs’ understanding of content, evaluating personal capability to use specific teaching practices, or unpacking specific goals from the lesson.</td>
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<tr>
<td>Teaching practice</td>
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<tr>
<td>Content</td>
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<tr>
<td>Short-term goal</td>
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<tr>
<td>Long-term goal/metacognitive</td>
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<tr>
<td><strong>Motivational:</strong> GTAs' reflection on the intentions in the past learning success or failure</td>
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<tr>
<td>Fatalistic</td>
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<tr>
<td>Constructive</td>
</tr>
<tr>
<td>Inhibited</td>
</tr>
<tr>
<td><strong>Selection:</strong> GTAs selecting situation in which they are likely to succeed or explicitly avoiding situation with potential for failure. GTAs describe their future decision-making.</td>
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<tr>
<td>Cursory</td>
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<tr>
<td>Detailed</td>
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<tr>
<td>Vision of Pedagogy</td>
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<tr>
<td>Other</td>
</tr>
</tbody>
</table>
Data Analysis

Analytical methods in this study included both deductive and inductive approaches associated with the development of codes followed by quantitative analysis. This follows the suggestion of Fereday and Muir-Cochrane (2006) who argued that the combined application of inductive and deductive approaches to the same qualitative data offers greater rigor from mutual reinforcement. The process of complementing a hybrid thematic analysis (inductive and deductive reasoning) with quantitative methods was also used to illustrate advanced analytical procedures that promote integration (Schmitz & Finkelstein, 2010). Here we present the process of qualitative and quantitative analysis organized by the order of the guiding research questions (Figure 1). For the first research question: after applying coding scheme in GTAs’ reflection analysis and generating sub-codes, we analyzed the frequencies of sub-codes to examine how sub-themes change in GTAs’ reflections from the first to the second iteration. To address the second research question, we used quantitative analysis to examine relationships between emerging sub-codes. Fisher’s exact test was used to determine statistical significance of these correlations since the total number of subjects was smaller than 30 and some cell counts for emerging themes in the table were smaller than 5 (Warner, 2013). For the analysis of the relationship between sub-codes, pre- and post- reflections were combined primarily due to the small numbers (15 pre- and 15 post-) and because the emphasis was on the overall direction of the associations rather than assessment of pre to post changes of sub-codes (Schmitz & Finkelstein, 2010). These new associations that could not have been observed through the qualitative analysis alone were useful for developing new relationships and theories. To address the third research question and examine how emerging sub-codes explain changes in GTAs’ self-efficacy and thus highlight factors contributing to self-efficacy, we matched changes in GTAs’ self-efficacy against reflection narratives. The results of this study presented in the following section highlight factors that shape conceptions and self-efficacy of GTAs’ who are teaching introductory mathematical students.

Figure 1. The process of complementing qualitative analysis with quantitative methods to gain in-depth understanding of the findings
Results

Frequency of Emerging Sub-codes within Cognitive, Affective, Motivational, and Selection Domains

The first research question focuses on changes in GTAs’ reflections of their micro-teaching experiences. We computed those changes by tracking emerging sub-codes. Definitions and statements consistent with the emerging sub-codes are provided in Table 1. Rather than tracking changes on the individual level, we report on the aggregate changes in the frequency counts of sub-codes from the first to the second reflection. The tallies shown in Table 2 are frequencies of sub-codes in the first and the second reflections.

<table>
<thead>
<tr>
<th>Broad Codes</th>
<th>Emerging Sub-Code</th>
<th>Number of Reflections Associated with Sub-Code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reflection 1</td>
<td>Reflection 2</td>
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<tr>
<td>Affective</td>
<td>Positive</td>
<td>7</td>
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<tr>
<td></td>
<td>Negative</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
<td>3</td>
</tr>
<tr>
<td>Cognitive</td>
<td>Teaching practice</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Content</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Short-term goal</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Long-term goal/metacognitive</td>
<td>7</td>
</tr>
<tr>
<td>Motivational</td>
<td>Inhibited</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Constructive</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Fatalistic</td>
<td>1</td>
</tr>
<tr>
<td>Selection</td>
<td>Cursory</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Detailed</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Vision of pedagogy</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>103</td>
</tr>
</tbody>
</table>

Note: The frequency of sub-codes is computed in the first and the second iterations (maximum number of each sub-code cannot exceed 15, which is the maximum number of the first and second iterations because there were 15 total participants; comparison is not pairwise)

Affective Domain

Table 2 shows relative shifts for Positive and Negative themes (sub-codes) within the affective domain of functioning from the first to the second reflection. These sub-codes represent types of emotional status ranging from negative to positive. The shift towards statements reflecting positive self-assessment in the GTAs second reflections (60%, nine out of 15) compared with their first reflections (46.7%, seven out of 15), suggests a moderate aggregate growth in GTAs’ confidence. Changes in Negative sub-codes are less notable (two vs four out of 15), and the frequency of the Neutral sub-code remained unchanged.

Cognitive Domain

Table 2 shows substantial shifts for sub-codes within the cognitive domain of functioning from the first to the second reflection. Sub-codes emerging within this level represent the extent to which GTAs’ believe their content knowledge can be applied during teaching. Content, Short-term Goal, and Long-term Goal were predominant sub-themes, prevalent in more than 50% of the first reflections, while the Teaching Practice sub-code was underrepresented, appearing in just three out
of 15 reflections. Analysis of the second round of reflections revealed a major shift toward the Teaching Practice sub-code (15 out of 15) which suggests aggregate growth in GTAs’ conceptions of pedagogical strategies that include content, goals, and students’ capacity to learn. The increase in the frequency of Teaching Practice sub-codes was paralleled by a reduction in other sub-codes (Content, Short-term Goal and Long-term Goal) in the analysis of the second reflection.

**Motivational Domain**

The frequency of emergent sub-themes within the motivational domain was relatively stable (Table 2). Sub-codes that emerged within this category represented the range of GTAs’ ability to respond to criticism and persist in achieving teaching goals. The Constructive sub-code, representing GTAs’ conceptions of patterns and variations in human development that influence teaching and learning and accountability for teaching outcomes, was present in all reflections except one in the first iteration. The Inhibited sub-code represents insufficient conceptualization of accountability for outcomes and occurred in six reflections across both iterations. Given that the Constructive sub-code was present in all reflections in the second iteration, it was possible to encounter both the Inhibited and the Constructive sub-codes within the same reflection. There was a negligible number of statements consistent with the Fatalistic sub-code which represents externalization of the accountability for teaching outcomes.

**Selection Domain**

Frequency counts for sub-codes in the selection domain of functioning were relatively stable (Table 2). The emerging sub-codes vary with respect to the detail and level of GTAs’ decision-making ability. As a result, the Cursory sub-code represents statements that briefly describe future avoidance behavior with no rationale; while the Detailed sub-code represents future choices accompanied by the rationale for the selected behavior. Table 2 demonstrates a slight reduction in the frequency of both sub-codes from the first to the second reflection. The Vision of Pedagogy sub-code represents statements that describe decision-making related to GTAs’ vision of themselves as a teacher and shows a slight reduction in the second iteration. The Other sub-code describes selection of project features associated with general pedagogical ideas and shows a negligible increase in the second iteration.

**Associations Between Emerging Sub-codes**

To address the second research question, we examined thematic associations between sub-codes within affective, cognitive, motivational, and selection domains across the first and the second reflections combined. Although we explored relationships between all possible sub-code (or theme) pairs, we report only those associations that were significant: 1) between themes within Selection and Motivational domains and 2) between themes within Affective and Selection domains.

**Associations Between Motivational and Selection Domains**

First, interrogation of the relationship between themes demonstrated that the type of Selection theme expressed in GTAs’ reflection depended significantly on the Motivational sub-code (i.e., Constructive, Inhibited, Fatalistic) that was present (Fisher test, \( p\text{-value} = 0.0166 \); Table 3).

Reflections containing Cursory statements were equally likely to be associated with any Motivational theme, whereas those consistent with the Vision of Pedagogy sub-theme were more
likely to be associated with Constructive Motivational sub-theme. This suggests that GTAs who understand patterns and variations in human development, and accept responsibility for teaching outcomes, have a higher tendency to express their long-term vision of themselves as a teacher. GTAs who conceptualize teaching as a malleable skill, in need of constant improvement, are more likely to focus on discussing pedagogical choices and strategies that would most benefit students. However, the association between Selection and Motivational domains of functioning was not absolute. There is no significant relationship between Detailed and Other sub-codes and Motivational sub-themes, potentially owing to the small sample of reflections.

Associations Between Affective and Selection Domains

Second, this examination of the relationship in the domains of functioning resulted in significant association between the Affective and Selection themes (Table 4). The type of Selection theme that was expressed in GTAs’ reflections significantly depended on the Affective theme (Positive or Negative) that was present (Fisher test, \( p\text{-value} = 0.044 \)). Statements consistent with Cursory sub-codes were equally likely to be associated with Positive or Negative affective self-assessment (Table 5). In contrast, statements associated with the Vision of Pedagogy sub-theme were more likely to be associated with the Positive sub-theme. This result suggests that GTAs who are positively affected by teaching experiences are also more likely to focus on discussing pedagogical choices and strategies that would most benefit students. The association between Selection and Affective domains was not absolute since no additional significant relationships were identified. We conjecture that the size of the dataset is imposing this limitation and suggest that future studies consider gathering longitudinal data from participants after subsequent professional development courses to ameliorate the situation and enable further interrogation of thematic associations.

Table 3. Association between motivational and selection domains

<table>
<thead>
<tr>
<th>Motivational Sub-codes</th>
<th>Vision of Pedagogy</th>
<th>Cursory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constructive</td>
<td>16</td>
<td>6</td>
</tr>
<tr>
<td>Inhibited or Fatalistic</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

Note. Numbers represent frequency of sub-codes in the first and second iterations combined (maximum number of first and second iterations combined is 30). Due to infrequency of Fatalistic sub-code, it was grouped with the Inhibited sub-code.

Table 4. Association between Affective and Selection domains

<table>
<thead>
<tr>
<th>Affective Sub-codes</th>
<th>Vision of Pedagogy</th>
<th>Cursory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Negative</td>
<td>0</td>
<td>3</td>
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</tbody>
</table>

Note. Numbers represent frequency of sub-codes in the first and second iterations combined (maximum number of first and second iterations combined is 30).
Self-Efficacy and Thematic Associations

To address the third research question and analyze how GTAs’ conceptions contribute to the changes in self-efficacy, we matched emerging sub-codes against changes in GTAs’ self-efficacy beliefs from pre- to post-survey data. Since the survey is designed to measure self-efficacy along two conceptual dimensions, Learning and Instructional, we physically separated the items in Table 5 along these two distinct sub-scales. To look for changes between pre- and post-survey responses we calculated item-specific pre-post gains by subtracting each individual’s pre-survey response from their post-survey response for each item.

Table 5 provides the difference from post- to pre-survey scores for all items. There was no notable difference in the changes in self-efficacy items that belong to Instructional subscale (41.90%; 44 out of 105) and items that are part of the Learning subscale (35.15%; 58 out of 165). To examine the ways in which GTAs’ conceptions inform changes in self-efficacy beliefs, we matched thematic associations with the changes in scores for selected participants. To select these participants, we focused on GTAs who better represented the range of changes in their efficacy score from post- to pre assessment: positive and negative extremes. Carter manifested the highest number of positive changes in efficacy scores (13). Thea was one of two GTAs who provided the highest number of negative changes in self-efficacy scores (6). We selected Thea because her post-efficacy scores manifested more notable depression on certain items compared with the other GTA’s scores. To examine ways in which GTAs’ conceptions inform their self-beliefs, these representative pre- and post-self-efficacy reports were matched against the respective reflection narratives (Reflection 1 and 2). Carter’s first reflection showed the presence of the following sub-codes: Constructive, Vision of Pedagogy, Teaching Practice, Detailed, Short-term, and Content. On the first self-efficacy report, Carter rated himself 4 or higher on every item for both Instructional and Learning subscales of the report. This self-reported rating on efficacy was accompanied by the presence of thematic associations between constructive approach and vision of pedagogy in Carter’s first reflection narrative. In addition to sub-codes present in the first reflection, Carter’s second reflection manifested presence of sub-codes associated with positive affect (Positive). His rating of self-efficacy was 5 or higher on post-survey. This rating well matched the thematic associations between Vision of Pedagogy, Constructive, and Positive sub-codes.
Table 5. Difference Between Self-Reported Scores from Post- and Pre-Self Efficacy Survey

<table>
<thead>
<tr>
<th>Conceptual Dimensions of Self-Efficacy Survey</th>
<th>Item #</th>
<th>Fabia</th>
<th>Isabel</th>
<th>Omar</th>
<th>Max</th>
<th>Tate</th>
<th>Charlene</th>
<th>Kim</th>
<th>Nell</th>
<th>Todd</th>
<th>Darren</th>
<th>Callie</th>
<th>Watson</th>
<th>Thea</th>
<th>Vera</th>
<th>Curran</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Subscale</td>
<td>Q1</td>
<td>1</td>
<td>1</td>
<td>-1</td>
<td>1</td>
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<td></td>
<td>Q2</td>
<td>-1</td>
<td>-1</td>
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<td></td>
<td>Q3</td>
<td>-1</td>
<td>-1</td>
<td>-2</td>
<td>-1</td>
<td>2</td>
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<td></td>
<td>Q5</td>
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<td>-1</td>
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<td>Q9</td>
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<td></td>
<td>Q10</td>
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<td>-1</td>
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<td>2</td>
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<td></td>
<td>Q14</td>
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<td>Q16</td>
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<td>1</td>
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<td>Q18</td>
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<td>Instructional Subscale</td>
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<td></td>
<td>Q6</td>
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<td></td>
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<td>Q8</td>
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Note. Empty cells designate zeros calculated by subtracting a participant’s pre-self-efficacy survey rating from the post-self-efficacy rating for each item on the survey.

Thea’s first reflection manifested a wider range of sub-codes: Constructive, Content, Vision of Pedagogy, Long-term, Teaching Practice, Short-term, and Detailed. Six out of eighteen self-efficacy items were rated as 3 or 4, the rest of items were marked as 5 or 6. The thematic associations present in the first reflection corresponded to a relatively high self-efficacy rating in the first survey. Since Thea’s post-efficacy rating was lower than pre-efficacy scores for 6 items, her second reflection was examined for the presence of sub-codes consistent with negative conception towards teaching, or negative affect towards instruction. Thea’s second reflection demonstrated two sub-codes in addition to those present in the first narrative: Fatalistic and Cursory. Fatalistic sub-code was used to describe statements associated with the loss of sense of internal agency and over reliance on external circumstances in explaining teaching episodes that were unsuccessful. Cursory sub-code describes surface-level decision-making related to teaching. Depressed ratings in Thea’s post-efficacy survey may have been explained by the presence of Fatalistic sub-code in her final reflection narrative.

Discussion

Our study investigated three fundamental research questions. The first question addressed the stability of emerging sub-codes from the first to the second reflection (Table 2). Whereas we observed small shifts in most sub-codes, there was a notable increase in the number of statements associated with the Teaching Practice sub-code. Since the course project centered around micro-teaching iterations, it may have directed GTAs’ attention to pedagogical decisions related to content, goals, and students’ capacity to learn. As a result, representation of the Teaching Practice sub-code was observed in all 15 reflections in the second iteration. Interestingly, the frequency count of sub-codes within the Motivational domain remained largely stable. This stability may be explained by the fact that the GTAs represented in this study are self-selected participants who chose to enroll at a teaching-focused institution, so they may already regard teaching as an evolving skill that requires constant work and improvement. The short duration of the induction phase may account for the lack of discernible
change in emerging sub-codes within selection and affective domains between the first and second iterations.

The second research question explored associations between emerging sub-codes and revealed several relationships (Tables 3 and 4). Statements consistent with the Constructive sub-code were distinctly closely related to the Vision of Pedagogy sub-code. This association suggests that GTAs who understand patterns and variation in human development are also more likely to have a long-term vision of themselves as a teacher. This finding agrees with prior research which shows that teachers who hold a constructive approach towards teaching and learning have a clear vision of teaching strategies (Jamil et al., 2012; Snyder & Lit, 2010). Statements associated with the Positive sub-code were related to the presence of the Vision Pedagogy sub-code. This result suggests that GTAs who have positive feelings with respect to their teaching experiences are more likely to visualize future teaching strategies. These findings are concordant with prior research linking a positive disposition and productive decision making (Newton, 2013). According to Newton (2013), positive disposition of teachers evokes pedagogical choices that result in an emotionally productive and creative classroom environment. Despite a notable spike in the number of statements associated with the Teaching Practice sub-code in the second iteration of reflections, there was no association involving the cognitive domain of functioning.

To address the third research question and explore the ways in which GTAs’ conceptions relate to their self-efficacy perceptions, we calculated changes in the self-efficacy ratings of all participants. Changes from pre- to post-survey responses in Learning and Instructional subscales suggest that it is possible to detect changes in novice instructors’ beliefs even after a brief summer developmental session. These results support prior findings that self-beliefs are indeed amenable to change (Schommer, 1990; Schommer, 1994). Instructional items of the self-efficacy instrument manifested just as much change in scores as did items in the Learning subscale, which suggests that the self-belief skills needed to prepare and teach a class are as amenable to change as the skills needed to stimulate student learning.

To examine how GTAs’ conceptions relate to their self-efficacy ratings, we matched changes in efficacy ratings to reflection themes for two GTAs. We focused on two GTAs who represented two extremes in the highest number of self-efficacy changes in a positive or negative direction. Thea manifested the greatest number of lower efficacy scores in post-assessment while Carter manifested the greatest number of exclusively positive changes in self-efficacy ratings. Higher rating in post-efficacy report corresponded to changes in Carter’s second reflection which included additional Positive sub-code. Carter’s second reflection also demonstrated thematic associations between Positive and Vision of Pedagogy sub-codes; specifically linking positive affectivity and decision-making related to teaching strategies. In contrast, Thea’s reflections included no Positive sub-code. Prior research has demonstrated a connection between positive affectivity, teaching strategies, and higher self-efficacy. For instance, analysis by Moe et al. (2010) revealed a mediating role of positive affect and self-efficacy beliefs in the relationship between teaching strategies and job satisfaction, and Jamil et al., (2012) showed a significant contribution of positive disposition to self-efficacy for pre-service teachers. Perera et al. (2018) demonstrated the role of teachers’ positive affectivity in predicting higher self-efficacy, work engagement, and job satisfaction. Together, these findings support thematic associations between positive affectivity and teaching strategies found in the present study and provide potential explanations for the ways in which positive affectivity influences self-efficacy and teaching strategies.

Thematic associations between Constructive and Vision of Pedagogy sub-codes found in this study did not fully align with changes in GTAs’ self-efficacy. Although both Carter and Thea demonstrated the presence of Constructive and Vision of Pedagogy in the first and second reflections, Thea’s second reflection contained Inhibited/Fatalistic and Cursory sub-codes consistent with the
loss of agency or ability to accept criticism and cursory description of decision-making related to teaching strategies respectively. Research has historically linked constructive thinking to higher teacher self-belief patterns (Cansiz & Cansiz, 2019). More specifically, study on pre-service teachers provides interpretation grounded in the developmental orientation of teachers’ beliefs. This interpretation implies that teachers with a developmental orientation understand the growing pattern in human development. As a result of this understanding, they embrace constructive approaches towards teaching as part of the teacher preparation process (Jamil et al., 2012). Because they understand patterns and variations in human development, pre-service teachers with constructive thinking draw upon developmental orientation in their teaching strategies and in supporting the academic growth of their students (Jamil et al., 2012; Snyder & Lit, 2010). Therefore, Carter’s constructive approach supported by developmentally oriented beliefs was more likely to treat micro-teaching struggles as challenges to be overcome, and less likely to interpret criticism as his own personal failure, which sustained relatively higher self-efficacy beliefs in pre- and post- assessment. Conversely, a reluctance to accept criticism may lead to lower post-efficacy ratings. Individuals who struggle with accepting criticism report greater anger in response to critical feedback resulting in lower self-efficacy ratings (Barron, 1988). Such rationale may account for the presence of Inhibited/Fatalistic sub-code in Thea’s second post-efficacy reflection in which she rated herself notably lower. Although her second reflection demonstrated thematic associations between the constructive teaching approach and the vision of pedagogy, the presence of negative attitude towards critical feedback may mark a loss of internal agency leading to a depression in efficacy.

Research demonstrates that mentoring programs that immerse pre-service teachers into a teaching experience enhance their personal and professional knowledge and carve out opportunities that promote participants’ long-term vision of themselves as teachers (Gallagher & Stahlnecker, 2002). It is possible that the induction program presented in this study had differential impact on GTAs and may have depressed efficacy scores in some of them. However, lower values in post-efficacy beliefs may well reflect transient doubt that is a necessary tool of knowledge (Wheatley, 2002). Wheatley (2002) interprets beneficial impacts of doubts on teacher’s efficacy as a substantial disequilibrium that necessarily generates reflection and a shift in thinking about one’s efficacy (Gallagher & Stahlnecker, 2002). The presence of inhibited/fatalistic attitude in Thea’s second reflection accompanied by lower efficacy beliefs may result from the uncertainty caused by micro-teaching experience, ‘what I thought I knew isn’t enough to deal with this new situation’ (Jones & Ninmo, 1999). However, this disequilibrium captured in Thea’s final reflection may be the starting point of a self-inquiry that is likely to stimulate further reflection, experimentation, and change (Gallagher & Stahlnecker, 2002; Wheatley, 2002).

Conclusion

This study examined conceptions and efficacy beliefs of 15 novice college mathematics instructors (specifically, GTAs) in the context of a summer professional development course centered around a micro-teaching lesson study experience. Results demonstrated correlations between GTAs’ positive affectivity and tendency to articulate vision of long-term teaching strategies. This thematic association was positively aligned with sustaining higher efficacy for a GTA who demonstrated the greatest number of positive changes in efficacy rating. Results also revealed a correlation between a constructive approach toward human development and vision of teaching strategies. However, this thematic association was not fully aligned with higher self-efficacy since Thea’s post-efficacy scores were depressed. Depression in efficacy scores can indicate a doubt that is essential for teacher reflection, since uncertainty can stimulate questioning of previously held assumptions (Wheatley, 2002). It is possible that feedback GTAs received from faculty members generated some internal
response which induced a negative change in efficacy ratings. A longer training period and more frequent micro-teaching opportunities may be necessary to promote effective reflection opportunities. Future research in this direction should generate finer-grained distinction between uncertainty as a tool of knowledge and induced uncertainty that inhibits GTAs efficacy.

Acknowledgments

This work was supported by a National Science Foundation Grant (DUE 1525623) to MvS. Any opinions, findings, conclusions or recommendations expressed here are those of the author(s) and do not necessarily reflect the views of the National Science Foundation. The authors wish to thank all STEM faculty and graduate research assistant participants at Bowling Green States University.

Appendices

Appendix 1. Questions that GTAs responded to after their first iteration of Micro-Teaching

Within 4 days of completing the first iteration of micro-teaching, GTAs were asked to watch the video of their micro-teaching presentation, read the feedback from the audience, watch the videos presentation of their group members, and provide written reflections in response to these three questions:

1. Focusing on the mini-lesson you conducted—how do you think this went? Explain what you might keep the same and what you might try to change if you could redo your portion of the lesson. Please be specific by incorporating details from the video and/or audience feedback.

2. Looking over your prepared materials for your mini-lesson (e.g., the lesson plan, solutions, and any other materials like visual aids or handouts that your group prepared), and comparing them with how things went in you and your partner's videos, do you think you and your group members accomplished your lesson goals? Why or why not?

3. In general, think about the process of creating and presenting these materials with your group: What did you learn about preparing lesson content and/or about teaching from this process?

Appendix 2. Questions that GTAs responded to after their second iteration of Micro-Teaching

Within 4 days of completing the second iteration of micro-teaching, GTAs were asked to watch the video of their micro-teaching presentation, read the feedback from the audience, watch the videos presentation of their group members, and provide written reflections in response to these five questions:

1. Focusing on the mini-lesson you conducted—how do you think this went? Explain what you might keep the same and what you might try to change if you could redo your portion of the lesson. Please be specific by incorporating details from the video and/or audience feedback.

2. Compare and contrast your personal mini-lesson presentation and communication aspects between the first and second iterations. Talk about what feedback and suggestions from [Communications faculty member], [Author 2], and/or audience members you specifically attempted to incorporate, how and why you tried to address those areas of concern, and why you think you were successful or not.
3. Now, comment on changes your group (as a whole) attempted to make between iteration #1 and #2. What feedback and suggestions from [Communications Faculty Member], [Author 2], and/or audience members did you and your group attempt to address? How successful do you think you all were? Incorporate specific evidence.

4. A new element required in iteration 2 was the incorporation of active learning techniques. Provide some details about what active learning techniques you personally attempted to use and how you think that went. If you got feedback from audience members about your use of active learning techniques talk about that here, too.

5. In general, think about the process of creating and presenting these materials with your group: What did you learn about preparing lesson content and/or about teaching from this process?

Appendix 3. Self-efficacy Survey (questions and directions were the same for pre- and post-surveys)

Survey Directions
For these 18 statements, please indicate how confident you are in your ability to accomplish the stated activities. Indicate (by selecting) the number [1-6] for each statement that best reflects your confidence level (1 is no confidence and 6 is complete confidence). Read each statement as an ending to this question: "How confident am I in my ability to..."

Learning Subscale
Q1) ...actively engage my students in the learning activities that are included in the teaching plan/syllabus?
Q2) ...create a positive classroom climate for learning?
Q3) ...promote student participation in my classes?
Q5) ...promote a positive attitude towards learning in my students?
Q9) ...think of my students as active learners, which is to say knowledge builders rather than information receivers?
Q10) ...provide support/encouragement to students who are having difficulty learning?
Q13) ...encourage my students to ask questions during class?
Q14) ...make students aware that I have a personal investment in them and in their learning?
Q15) ...let students take initiative for their own learning?
Q16) ...show my students respect through my actions?
Q18) ...encourage the students to interact with each other?

Instructional Subscale
Q4) ...prepare the teaching materials I will use?
Q6) ...evaluate accurately my students′ academic capabilities?
Q7) ...clearly identify the course objectives?
Q8) ...appropriately grade my students’ exams/assignments?
Q11) ...stay current in my knowledge of the subject I am teaching?
Q12) ...provide my students with detailed feedback about their academic progress?
Q17) ...spend the time necessary to plan my class

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These subscale titles did not appear on the self-efficacy survey GTAs answered. They are included here to help the reader in aligning question statements and subscales. The question numbers indicate the order in which statements were presented on the self-efficacy survey.
References


Enhancing Pre-service Teachers’ Self-Efficacy for Teaching Diverse Learners: Capturing Young Students’ Attention through a Read-a-loud and Music

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Abstract: The sense of efficaciousness for engaging diverse learners was examined with twenty-four pre-service teachers concurrently enrolled in a junior-level Creative Arts methods course and a field experience course with placements in K-2 general education classrooms. The pre-service teachers participated in music and literacy activities in their university class, then planned and implemented standards-based music activities in literacy lessons with their young students. In this case study, both quantitative and qualitative data were collected, including a teacher self-efficacy scale, an attitude survey, written reflections, interviews, open-ended responses, and lesson plans. Results demonstrated a significant increase in the pre-service teachers’ self-efficacy in pre-post rating analysis and indicated that this project contributed to their efficacy in engaging and meeting the needs of diverse learners in elementary classrooms. The pre-service teachers demonstrated proactive classroom management and reflected upon their students’ increased focus in class. The pre-service teachers indicated that their success with these types of projects encouraged them to plan for similar implementation with their future diverse learners; therefore, providing the potential to positively impact their future performance. Additionally, this project emanated Scholarship of Teaching and Learning (SoTL) by encouraging self-reflection; examining and applying effective teaching strategies; and advancing the field of teacher education.

Keywords: self-efficacy, pre-service teachers, creative arts, diverse learners, Scholarship of Teaching and Learning (SoTL).

Introduction

Teacher preparation programs are tasked with equipping teacher candidates with the skills and knowledge they need to develop efficacy in their abilities for instructing students, meeting the needs of diverse learners, and managing their classrooms. High efficacy has been shown to contribute positively to candidates’ attitudes and their effectiveness in instruction and effort (Bandura, 1997; Bodur et al., 2012; Tschamann-Moran, et al., 1998; Yost, 2006). What effect does integrating music in a read-aloud have on pre-service teachers’ self-efficacy for meeting the diverse needs of K-2 students?” The impetus for this research question is for the instructor to examine the teaching and learning in her classroom, and enhance pre-service teachers’ experience by (a) equipping them to take skills gained from a creative arts class and apply them within their practicum experience, (b) providing them the opportunity for an increasingly richer and meaningful field experience through arts integration, (c) drawing from them a more critical level of reflection, and (d) stimulating within them a higher sense of efficaciousness for addressing diverse learners as they journey through their Early Childhood Education (ECED) program.

Pre-service teachers in our program typically need much support in the skills of identifying and addressing the needs of diverse learners in their lesson planning and implementation. According to a study conducted within the program (Arrington & Lu, 2014), our pre-service teachers frequently...
pinpointed the following two diversities as challenging in their English Language Arts (ELA) classes in their first practicum experience: (a) attention or focus, and (b) auditory processing. This study focuses on these two areas of diversity. These two weaknesses, along with an influx of English Language Learners (ELLs), contributed to the pre-service teachers’ concerns about meeting their students’ needs.

In this study, pre-service teachers who were enrolled in a Creative Arts course had the opportunity to address the attention and focus of young learners in a Kindergarten, first- or second-grade English Language Arts classroom by sharing a read-aloud with music integration. The reflections on this experience with their young learners showed a positive impact on their ability to develop teaching strategies that meet the literacy needs of diverse learners and on their self-efficacy in teaching in this area. The use of this strategy resulted in an increased level of engagement and interaction of students in their lessons, thus improving teaching and learning in their Creative Arts Methods course and the practicum course (Methods I) in which they were concurrently enrolled.

The teacher/researcher employed these steps in the project: (a) determined the need in her classroom for equipping pre-service teachers with a variety of strategies for engaging and meeting the needs of their young learners in the ELA classroom, particularly those in focusing and processing; (b) conducted a study to determine the effectiveness of the applied pedagogy, implementing music activities with a read-aloud; and (c) disseminated recommendations for practice. Therefore, the progression of this project is reflective of Hutchings’ and Cambridge’s (1999) definition of Scholarship of Teaching and Learning (SoTL): “…problem posing about an issue of teaching or learning, study of the problem through methods appropriate to disciplinary epistemologies, applications of results to practice, communication of results, self-reflection, and peer review” (as cited in McKinney, 2007, p. 6).

The Literature

Music, Literacy, and Diverse Learners

Teacher preparation programs are challenged with empowering candidates with the tools necessary for coping with encounters, such as meeting the needs of diverse learners, they will face throughout their practicum experiences and as they begin teaching in their own classrooms. Using music activities is one way to involve diverse learners in lessons, and the use of music has benefits that contribute to literacy development in young students.

Research has demonstrated that music contributes to focused attention and enhances auditory processing. For example, Bayless (as cited in Wolf, 1986) contributes that focused listening provides students the opportunity to attend to specific sounds—a basic of music learning. Additionally, these focused opportunities using a variety of music, are essential in the development of auditory abilities and provide “opportunities for children to determine the music they like and to make new connections with sounds they have never heard before” (Isbell & Raines, 2013, p. 194). According to Richards (2020), well-planned chants with a read-aloud have been shown to help students remember concepts, learn vocabulary, and capture their attention and imagination. Additionally, their rhythmic acuity can be developed; and such skills as sequence, auditory memory, and expressive language may be enhanced.

According to the Common Core State Standards Initiative (CCSS, 2012), literacy instruction is the responsibility of all content areas, which includes music education. Similar themes are shared between CCSS for English Language Arts (ELA) and the National Standards for Music Education (NAfME, 2014). Some of the commonalities between these sets of standards include demonstrating independence, having strong content knowledge, comprehending, critiquing, and understanding other
perspectives and cultures (Weidner, 2013). Additionally, other learning-to-read skills correlate with
music literacy skills. These include phonological awareness, sight identification, orthographic
awareness, and fluency (Hansen & Bernstorf, 2002). Coleman (n.d.), one of the authors of the
Common Core State Standards, developed the Guiding Principles for the Arts and made connections
between these principles and literacy, such as in principle one: “Studying works of arts as training in
close observation across the arts disciplines and preparing students to create and perform in the arts”
(para. 2). The connection to literacy standards includes sustained observation and attention to detail
in reading. In both of these areas, it is recommended that the curriculum is designed to enable students
to develop observation and analytical skills as part of their college and career readiness.

Students with diverse learning styles, specifically in literacy, can be motivated through music.
Chants are fun tools, and students at all levels of language acquisition can benefit from their use (Tavil
& Isisag, 2009). Furthermore, the students benefit from being actively involved in the musical
rhythms, memorizing and pronouncing words from repetitious use of vocabulary; and being able to
participate with others (Leah, 2016). Heydon et. al (2017) noted that kindergarten students improved
their oral language and literacy when participating in musical activities with senior adults in an
intergenerational and collaborative literacy project. Similarly, third graders’ reading and writing skills,
along with their self-efficacy for completing tasks, improved as a result of engaging in a service-
learning music project with local nursing home residents (Arrington, 2015). The researchers in each
of these interactive studies attributed students’ increased motivation and self-efficacy to drawing upon
multiple modes of communication (singing, gestures, speaking) and not simply to print literacies.

Cornett (2015) reminds us that music is a form of communication and can provide students
with the opportunity to understand and express their thoughts and feelings. Listening to and making
music can bridge the cognitive, emotional, and aesthetic processes of varied learners. Cornett (2015)
adds that Arts Integration (AI) teachers address diverse learning styles by using a combination of
language arts and music to motivate, deliver content, and provide students with a wide range of
opportunities to demonstrate their knowledge and understanding.

Asaridou and McQueen (2013) suggest that both the development of music and speech are
shared – a “mutual interaction across domains” (p. 1). In recent brain research, musical rhythm has
been shown to positively affect auditory processing and speech/music perception (Skoe & Kraus,
2012; Tierney & Kraus, 2013). Saffran (2002) conducted experiments with infants (head-turning) and
adults (tone words) and concluded that lullabies and children’s play songs, with their simple structure,
are crucial to the acquisition of tones and language. Using music and print with children’s song-based
books has been shown to support children’s oral language and early print literacy concepts, and
incorporating musical activities with rhythm and pitch has been shown to support reading fluency
(Gabriel & Countryman, 2014; Montgomery & Smith, 2014). Finally, Bernstorf (2013) reminds us that
good music literacy can “provide the very same benefits as those who teach language reading, plus the
enjoyment of an arts experience” (p. 2).

Teacher Self-Efficacy

In explaining the concept of self-efficacy, Bandura (1994) offers, “One's self-judgments of personal
capabilities to initiate and successfully perform specified tasks at designated levels, expend greater
effort, and persevere in the face of adversity” (p. 71). Later, Bandura (1997), adds “…beliefs in one’s
capabilities to organize and execute the courses of action required to produce given attainments” (p.
3). Perceived self-efficacy is not concerned with the amount of skill one has, but with what one believes
can be done with what they have.

Four determinants of self-efficacy include (a) experience, or actual performance, (b) modeling,
or vicarious experiences, (c) social persuasions, or verbal persuasion, and (d) physiological factors, or
cues (Bandura, 1997). Bandura asserts that experiences (referred to as Enactive Mastery Experiences) have the most influence on self-efficacy. For example, successes contribute to the building of self-efficacy, and failures may undermine it. Bandura (1997) further offers that difficulties can actually provide opportunities to learn how to turn failure into success. Pajares (2005) avers that this determinant of efficacy in life choices is critical for college-level students due to the many academic choices available to them; they will most likely participate in courses and activities in which they believe they can succeed and may avoid those that they perceive as beyond their confidence level.

Several other contributions to efficaciousness are noted, such as motivation, preparedness, and attitude. Tschamannen-Moran, et al. (1998) reported that pre-service teachers’ self-efficacy tends to be established early on and becomes resistant to change. They further recommend that more opportunities for working with the students in a variety of contexts and levels of difficulty should be given to teaching candidates. Efficaciousness is affected by one’s motivation, which further affects achievement and the ability to achieve and persevere (Tschamannen-Moran et al., 1998; Zimmerman et al., 1992). Being properly prepared contributes to pre-service teachers’ efficacy in teaching. Berke and Colwell’s (2004) survey confirmed that pre-service teachers’ comfort level with teaching music in the elementary classroom increased significantly after participating in several assignments that integrated music activities into their curriculum. They further concluded that pre-service teachers’ confidence in promoting the use of music in their classrooms is affected by their instructors’ use of meaningful and appropriate activities to bolster their preparedness. Attitude also affects teachers’ efficacy. Kaleli (2020) administered a Teacher Attitude Scale and an Individual Teacher effectiveness Scale developed by Turkish researchers Kahrmanoglu et al., and Sunbul & Arslan (as cited in Kaleli, 2020). Their findings demonstrate a positive relationship between teacher attitudes and self-efficacy beliefs.

Music integration in the setting of this study, alongside its emphasis on reflection, is a model that coincides beautifully with this insight provided by Yost (2006):

Programs have the capacity to ensure that coursework is tied to field experiences and that critical reflection is interwoven throughout the educational experience…reflection requires real-life dilemmas and requisite problem-solving skills…Resilient teachers are those that can think deeply, problem solve and feel confident in their ability to meet the needs of their students. This leads to high levels of self-efficacy, which in turn leads to greater persistence and risk-taking (p. 74).

With findings consistent with Yost’s conclusions, Bruinsma and Jansen (2010) assert that teacher self-efficacy had a positive correlation to the time the pre-service teachers intended to stay in the profession. Additionally, in a study of pre-service teachers in practicum courses (Bodur et al., 2012), teacher self-efficacy was reported higher among the pre-service teachers enrolled in the second-level practicum course than for those participating in the first-level practicum course. The researchers concluded that this could be related to their more intense level of involvement with their students at the second level of practicum experience. “The higher efficacious teachers appear, the more competent and confident they demonstrate in teaching practice” (Bodur et al., 2012, p. 6). The goal of this project was to have the pre-service teachers more involved with their students, and to provide them with application-to-practice opportunities in their practicum classrooms (Darling-Hammond, 2006; Vignoli et al., 2018); thus, contributing to a higher level of efficacy.
Methodology

Participants

In this study, the terms pre-service teacher and candidates are used interchangeably; and the terms instructor and teacher/researcher are used interchangeably. The participants in this study included 24 second-semester Early Childhood Education (ECED) pre-service teachers enrolled in a P-5 Creative Arts Methods course. These pre-service teachers were second-semester juniors; 23 were female and 1 male; all, except one female, were of traditional college age. They were concurrently enrolled in a practicum course (Methods I) with their first teaching field experience placed in a Kindergarten, first, or second grade (K-2) classroom in a Partner School (public elementary school within a 60-mile radius of our university campus). In this experience, they spent approximately 200 hours during the semester observing their Clinical Supervisor (host teacher), writing plans for and teaching three stand-alone lessons, and planning/teaching a 5-day unit of instruction to be evaluated by the University Supervisor (instructor/professor supervising the field experience). They were also enrolled concurrently in a Children’s Literacy class. Throughout the semester, the instructors in this block of courses (Creative Arts, Children’s Literacy, and Methods I) encouraged the candidates to make connections across their courses, shared resources, and collaborated to support the pre-service teachers in creating developmentally appropriate, standards-based ELA lessons to implement in their practicum classes.

The instructor of the course earned a Ph.D. in Curriculum and Instruction and is an Associate Professor in the Early Childhood Education program—a Bachelor-level program for training and certifying pre-service teachers for Pre-K to Fifth Grade (P-5). Prior to teaching full-time in higher education, she taught in a public school system at the elementary level—in both the elementary general classroom and the elementary music classroom; and she earned National Board Certification.

The course activities of P-5 Creative Arts Methods included the pre-service teachers studying the standards and elements of each area of the arts (Visual Arts, Music, Dance, and Theatre), participating in creative arts activities in class, and developing activities in the arts that could be incorporated into lessons in their elementary classrooms. The instructor of the Creative Arts methods course was awarded a mini-grant to develop a Creative Arts Resource Center. This repository consisted of various musical instruments, manipulatives, copies of children’s literature titles, and other supplies for use in the Creative Arts classroom on campus. These resources were also made available for checkout by the candidates to use when they implemented their lessons in their practicum classrooms.

In this project, candidates were involved extensively in a special musical activity with the book *Tacky the Penguin* (Lester & Munsinger, 1988). In the Creative Arts class, the pre-service teachers were “students” involved in creating instrumental or vocal soundscapes, chants, and motions for characters and events in the book. Several characters had specific instrument sounds assigned to be played when their name was called in the story (e.g., a different bell pitch for each of the companion penguins, and a tambourine for Tacky); several groups of characters had chants assigned for their actions, which were accompanied with rhythms on drums; and some groups of characters had movements created to demonstrate their actions (diving, marching, etc.) during the story. Students practiced their instrument, chant, or action; and they were obligated to pay attention throughout the story for their specific cues. This activity, created and published by the teacher/researcher, has also been presented at educator workshops for both music educators and general classroom teachers (Arrington, 2013).

In preparation for the project, the teacher/researcher instructed candidates on the proper use of the instruments and other materials, demonstrated appropriate strategies for introducing these materials to young students, and involved everyone in the Creative Arts class in the *Tacky the Penguin* activity described above. The pre-service teachers had an opportunity to reflect upon and discuss their
experience after the activity by asking questions, submitting concerns, and making applications to other children's literature selections. This discourse focused on the two needs of diverse ELA learners previously identified: (a) attention/focus, and (b) auditory processing (Arrington & Lu, 2014). After participating in this and a variety of other similar musical activities with children’s literature, the candidates were required to develop and submit their own standards-based, music-integrated read-aloud activities. The instructor provided feedback and approved the activities; then, each candidate included their approved activity in a lesson plan to implement during an ELA unit taught in their K-2 field placement classroom.

The candidates selected appropriate, endorsed children’s literature titles (Cornett, 2015) for their read-aloud, in which they incorporated their approved music activity. See Figure 1 for titles used in this project.

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<th>Title</th>
<th>Author, Illustrator, Date, Publisher</th>
</tr>
</thead>
</table>

Figure 1. Children’s Literature Titles Used in the Project

An IRB proposal was submitted for an expedited review and written permission was secured from Dr. Bandura at Stanford University to administer his Teacher Self-Efficacy Scale (See Appendix) in this study. The IRB proposal stipulated that only K-2 students who had photo/video permission on file in their school setting could be represented in the pre-service teachers’ presentations and that no identifying information would be shared about the schools or students.

Research design

Multiple methods were used for data collection and analysis in this case study. Quantitative data consisted of the Teacher Self-Efficacy Scale (Bandura, 2006) as a pre- and post-test measurement; a beginning and endpoint Likert rating scale which contains five items from the Teacher Self-Efficacy Scale related to addressing diverse learners’ needs; and an attitude survey rating the pre-service teachers’ perceptions during the implementation of creative arts activities in their classrooms. Data
were entered into SPSS, and independent samples t-tests were conducted to determine the differences
between the candidates’ pre- and post-test scores, their rating scale scores, and their attitude survey
results.

Qualitative data consisted of written reflections, interviews, instructors’ field notes and
feedback, Creative Arts integrative lesson plans, and open-ended responses from the attitude survey.
The pre-service teachers were encouraged to share artifacts from their experiences (e.g., photos of
them engaging in their activities, and sample charts/graphs) to demonstrate the outcomes of their
lessons. NVivo software was used to highlight and organize the data in order to reveal recurring
themes. The quantitative and qualitative data were triangulated to capture different dimensions of the
experience and perception of the pre-service teachers during the project.

Results

Quantitative Results

The Teacher Self-Efficacy Scale (Bandura, 2006) was administered pre- and post-project. Quantitative
results revealed a significant difference between the pre- and post-scale general teacher self-efficacy
ratings (see Tables 1 and 2).

Table 1. Pre- and Post-Scale Statistics.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Pre-test</th>
<th></th>
<th>Post-test</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>Std. Deviation</td>
<td>Mean</td>
<td>Std. Deviation</td>
</tr>
<tr>
<td>SE Scale</td>
<td>24</td>
<td>6.33</td>
<td>0.78</td>
<td>6.69</td>
<td>0.88</td>
</tr>
</tbody>
</table>

Table 2. Pre- and Post-S.E. Scale Ratings.

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-Post-Assessment</td>
<td>-.36</td>
<td>.81</td>
<td>.17</td>
<td>-2.18</td>
<td>23</td>
<td>.04</td>
</tr>
</tbody>
</table>

Additionally, five statements (# 5- #9) on the survey were specifically related to their self-efficacy
for meeting the needs of diverse learners and included: (#5) getting through to the most difficult
student, (#6) promoting learning when there is lack of support from the home, (#7) keeping students
on task on difficult assignments, (#8) increasing students’ memory of what they have been taught in
previous lessons, and (#9) motivating students who show low interest in schoolwork. The candidates
demonstrated a significant increase in efficacy for item #8, increasing students’ memory of what they
have been taught in previous lessons. (See Table 3.)

Table 3. Comparison of Means – S.E. Meeting Diverse Needs.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>-.04</td>
<td>1.23</td>
<td>.25</td>
<td>-17</td>
<td>23</td>
<td>.870</td>
</tr>
<tr>
<td>6</td>
<td>-.29</td>
<td>1.00</td>
<td>.20</td>
<td>-1.43</td>
<td>23</td>
<td>.166</td>
</tr>
<tr>
<td>7</td>
<td>-.04</td>
<td>1.33</td>
<td>.27</td>
<td>-1.5</td>
<td>23</td>
<td>.880</td>
</tr>
<tr>
<td>8</td>
<td>-.63</td>
<td>.92</td>
<td>.19</td>
<td>-3.32</td>
<td>23</td>
<td>.003</td>
</tr>
<tr>
<td>9</td>
<td>-.08</td>
<td>1.02</td>
<td>.21</td>
<td>.40</td>
<td>23</td>
<td>.692</td>
</tr>
</tbody>
</table>


P<.05
The pre-service teachers also rated their attitude toward the effects of implementing their music-based activities. In some methods courses, candidates only have the opportunity to develop and demonstrate their lesson activities in class with their peers. In the Creative Arts class, they were fortunate to have opportunities to share their activities with their peers and to share with young students during their field experience in their concurrent practicum class. First, they compared the sharing of their activities with peers in class versus implementing the activities with their K-2 students, and then they rated the level of the activities’ contribution to their (a) efficacy for meeting the needs of diverse learners in their classroom, (b) understanding of the integration of creative arts in the elementary classroom, and (c) efficacy for integrating creative arts in the elementary classroom. Only two candidates indicated that sharing with peers contributed most to the above-named criteria. Seventeen candidates indicated that implementing with peers and K-2 students contributed equally to their understanding of and efficacy for integration of creative arts, whereas only nine indicated that they equally contributed to efficacy for meeting the needs of diverse learners. Fifteen responded that implementing with their K-2 students provided the most efficacy for meeting the needs of diverse learners and less than seven indicated that K-2 implementation contributed to an understanding of and efficacy for creative arts implementation. (See Figure 2.)

![Figure 2. Attitude toward Contributions of Music Literacy Project](image)

Additionally, the pre-service teachers rated their attitude toward the implementation of their music-based or similar activities in future classrooms. One pre-service teacher indicated that they were very unlikely to implement the music-based or similar activity in the future, and eighteen indicated that they were very likely to use similar projects in their future classrooms (see Figure 3).
Figure 3. Attitude toward Implementation of Music Literacy Projects in Future Classrooms

Qualitative Results

In qualitative analysis, the reflections and open-ended responses were coded. Three major themes emerged, as follows: (a) pre-service teachers became more aware of the benefit of providing a variety of learning experiences, including integrating music activities; (b) diverse students’ learning was enhanced from this experience; and (c) pre-service teachers demonstrated augmented skills in planning behavior management strategies to organize activities for success in these types of lessons. Excerpts are provided in Figure 4.

<table>
<thead>
<tr>
<th>THEME: Pre-Service Teachers’ Awareness Increased</th>
</tr>
</thead>
<tbody>
<tr>
<td>“It was hard work putting this together and setting this up. But it was worth it…It made me realize that with a little extra time and planning, music can be integrated into other curricular areas and the students can learn a lot from it…” (PST#1).</td>
</tr>
<tr>
<td>“It definitely helped me see the importance of using creative arts in the classroom” (PST#2).</td>
</tr>
<tr>
<td>“[I saw] firsthand by being involved that you can teach content in different ways…” (PST#2).</td>
</tr>
<tr>
<td>“I think this activity showed me to think outside the box when planning…” (PST#4).</td>
</tr>
<tr>
<td>“It also made me think of different aspects of creative arts that could be used to help diverse learners, especially if they are more drama filled or movement/dance filled. It would work best to incorporate all aspects of creative arts in the classroom to make sure that all students enjoy and learn in the classroom when creative arts are involved in the classroom” (PST#6).</td>
</tr>
<tr>
<td>“It made me want to incorporate music into my lessons more often. I saw that the students enjoyed making music with the instruments and that makes me want to see my future students enjoy using music in lessons as well” (PST#8).</td>
</tr>
<tr>
<td>“Implementing this activity impacted me as a teacher by showing me that a little effort in a lesson goes a long way” (PST #9).</td>
</tr>
<tr>
<td>“I really liked that we were able to do this with our elementary class instead of trying it on our fellow classmates. It gave me a better idea of how it would be if I used it in my future classroom” (PST #11).</td>
</tr>
</tbody>
</table>
“I am very happy that I had to do this music literacy lesson this semester. I have never really enjoyed music or wanted to teach with it but after the lesson I will definitely be doing it more often in my career” (PST#9).

**THEME: Diverse Students’ Learning Enhanced**

“This activity impacted the diverse learners by keeping their interest and it gave them something to do hands on, which really helped them stay focus [sic] and on task” (PST#3).

“During this lesson students needed to pay special attention to their specific roles, listening carefully for their cues to play their instrument. Specific students were assigned certain instruments for a reason. For example, an ADHD student was assigned to play a horse during the lesson, allowing him multiple opportunities to stand up and move during the lesson. Additionally, a QUEST student and other higher level students were assigned bells, which required them to listen more frequently for their cue to play. Students with an IEP were placed in a large group with other students, this group acted as a guide to help these students know when to play. However, regardless of the instrument assigned, all students were able to stay engaged during the lesson as everyone was actively listening for their assigned cue. On top of this, by hearing the sounds and seeing the motions, both visual and auditory learners were able to more closely follow along with the story, thus aiding their comprehension of the text” (PST#9).

“The students were really excited because they are always eager to have a specific role in the lesson and they love singing” (PST #4).

“I have a class that normally misbehaves a lot. But conducting this activity got everyone involved and they loved it. I was actually shocked at how well they all participated” (PST#2).

“It was so much fun and the students loved it. They would have loved just reading Tacky and doing an activity about it for ELA, but they loved it even more with the integration of musical aspects and instruments” (PST#1).

“I think doing activities like this can really help you get your students involved and actually want to participate” (PST#3).

“After hearing ‘Wow, this is fun! and I wish we could do this a lot more,’ I realized the impact that the instruments had on their interest and overall participation and comprehension of the reading and the story. I will definitely use music in my future classroom” (PST#5).

**THEME: Pre-service Candidates’ Behavior Management Skills Augmented**

“This lesson had the potential to go horribly wrong. I was very nervous to give a group of six year olds musical instruments, but with a well thought out behavior management plan and a little enthusiasm I was surprised at how well it went” (PST#9).

“I loved watching the students during this activity as they had such a good time! At first I was rather apprehensive, thinking I would have a hard time controlling the students while they all were playing. However, the lesson far exceeded my expectations. Every student had a smile on their face during the lesson, and it was so lovely to see” (PST#10).

Figure 4. Themes from Candidate Reflections. PST = Pre-service Teacher.

**Triangulation of Data**

Data were compared across multiple sources of collection to enhance the validity of the results. As presented in Table 3, pre-service teachers significantly noted that diverse learners’ ability to remember past content was affected in their lessons (p=.003), and was confirmed by reflections that resulted in the second theme of Figure 4: Diverse Students’ Learning Enhanced. In Figure 2, candidates indicate that implementing the activities with their young students was most beneficial to their understanding of meeting diverse needs (as compared to implementing with peers in their methods course), and was
reiterated in all themes of Figure 4 as they described the engagement and excitement of their learners. Both Figures 3 and 4 indicate that pre-service teachers are likely to implement music activities with literature in their future classrooms.

**Discussion**

**Findings**

*Pre-service teachers became more aware of and adept at implementing multiple strategies*

Tomlinson (2020) reminds us that a variety of strategies, approaches, and methods are necessary to successfully teach reading; and teachers must understand “teaching methods and the human beings to whom we apply those methods” (p. 93). As indicated earlier, the pre-service teachers were enrolled in the Creative Arts course concurrently with their first practicum course. Previously, they had developed and presented arts integration lessons to their peers in class and had discussed how they would implement them in their assigned grade levels. In this project, however, they actually implemented the activity with young children in their field placement classrooms. Traditionally, some of the candidates enrolled in this course had been hesitant to “think outside the box” to integrate the arts—sometimes due to a lack of confidence or experience in the arts, sometimes due to a perceived lack of time during their lessons. During their self-reflections on this project, the pre-service teachers indicated they will actually utilize their fine arts lessons or similar activities in their future placements and classrooms with comments such as “…definitely be doing it more often in my career;” “…makes me want to see my future students enjoying using music in lessons…” “…makes me think of different aspects of creative arts that could be used to help diverse learners” (excerpts from student reflections). Additionally, during class meetings, candidates shared that they were already planning to create read-aloud activities with other books similar to those demonstrated in class. They asked questions about where to acquire some of the instruments (specifically the woodblocks, tambourine, and small drums); other materials (specifically the scarves), etc. I reminded them that while enrolled in the teacher education program, they would have access to the Creative Arts Resource Center for checking out these items. Additionally, I provided them with websites of sources of inexpensive basic items to start collecting for their future classrooms. I also recommended that when they begin teaching, they put out requests to their students’ parents at the beginning of the school year. I shared from my experience in previous years of elementary-level teaching, that parents were willing to donate art supplies and small items for these types of projects—some had even donated specific instruments! The excitement of this project reached beyond their field-placement classrooms, as several candidates created and presented a research poster at an international conference. During their discourse with the attendees, the pre-service teachers very confidently illuminated their ideas for the implementation of these types of projects with their future students. I also noticed that while they were discussing their own projects, they gleaned knowledge from experienced teachers who provided the candidates with additional ideas for creating arts projects and acquiring resources. The Students’ Rating of Instruction (SRI) completed at the end of the course indicated that the hands-on opportunity better-equipped candidates to implement music activities in the future; and they noted that the course textbook (Cornett, 2015) was a great resource, providing a variety of creative arts strategies they could readily implement within their future elementary classrooms. As a result of this project, these pre-service teachers have indicated a higher level of self-efficaciousness for implementing these experiences in their future lessons.
Pre-service teachers developed more understanding of their students’ interests and learning styles

As they engaged students in lessons with various formats, they were helping the students “shape and assemble their literacy identities” (Parry & Taylor, 2018, p. 109), thus enhancing their reading experience. Tomlinson (2015) reminds us that in the 21st century, students will require classroom teachers to be more responsive to the “broadening array of cultures, languages, experiences, economies, and interests represented in most contemporary classrooms…” (p. 203). A major component of this project addressed how the arts can be used to accommodate diverse learning styles and cultures in their classrooms, and it became evident in the pre-service teachers’ Creative Arts lesson plans that they are becoming more experienced in assessing their students’ needs and in planning a variety of developmentally appropriate and culturally relevant activities to address those needs. Based on the reflections of successful experiences during the music integration lessons, this project has enriched pre-service teachers’ planning and teaching in both courses—Creative Arts and their Methods I Practicum Course.

Pre-service teachers avoided potential issues that had previously occurred when students found some reading exercises meaningless

We are reminded by Tomlinson (2020) that when students encounter some reading activities/texts they deem boring or frustrating, they may “become ‘behavior problems’ as a means of escape” (p. 93). Several pre-service teachers reflected upon the experiences in which those students (who had previously demonstrated challenging behavior) showed more interest in the activities, became engaged, and did not display behavior problems.

Pre-service teachers demonstrated a need for developing deeper self-reflection skills

The instructor/researcher noted that some of the reflections were very brief and lacked depth. As our teacher education program continues to prepare our pre-service teachers for completing their certification requirements, there will be more emphasis placed on the intense reflective component during practicum experiences. Inasmuch as reflection was a vital component of this project, the pre-service teachers’ experiences contributed to the development of skills needed to reflect at a level exemplary of teachers who are “ready for the job.” This ongoing development of reflection skills will ultimately contribute positively to the required review of their work, based on the edTPA requirement for aspiring teachers: “demonstrate readiness to teach through lesson plans designed to support their students’ strengths and needs; engage real students in ambitious learning; analyze whether their students are learning, and adjust their instruction to become more effective” (AACTE, 2023, para. 4). As a result of their music integration lessons, our candidates will be better prepared to teach all students—being better able to identify and accommodate their K-2 students’ diversities, and becoming more self-efficacious in the process.

Recommendations for Practice

Share Expertise

Implementing this project allowed the instructor to teach within a “comfort zone” based on her experience and expertise from years of teaching elementary students—in the general education classroom enhancing lessons with music integration, and in the music education classroom connecting with the general education curriculum. During those years as an elementary practitioner, she gained
valuable knowledge about the developmental appropriateness of the activities, which were modeled in the Creative Arts class. This expertise of an instructor is applauded in a study by Nature (2007), who emphasized that faculty in academia should provide creative and passionate teaching and that students have a chance to build upon specialized knowledge under the leadership of an expert. As other instructors embrace this type of Enactive Mastery Experience (Bandura, 1997) for their own pre-service teachers, they will gain efficaciousness in their own teaching; this, in turn, will radiate to the pre-service teachers studying under their charge.

**Utilize Resources**

Much of the success of this project can be contributed to the hands-on experience and the ability to check out materials—this was made possible by the teacher/researcher equipping the university classroom with the Creative Arts Resource Center and expertly demonstrating the varied resources (instruments, books, scarves, recordings). Literature titles conducive to music-integration activities recommended by Cornett (2015) were included in the Center, and a list was provided in the course textbook for the students’ convenience. Using these resources, the instructor involved the teacher candidates at two levels: (a) first as “students of the arts,” participating directly in the activity; then, (b) as “teachers of the arts,” discussing how they will implement and make connections with the young students in their classrooms. As pointed out in several pre-service teachers’ reflections, their young students were more engaged as a result of the hands-on materials and instruments they brought to their lessons.

**Be Reflective**

The results from data analysis forced the teacher/researcher to examine and reflect on practice. For example, the analysis of pre-service teachers’ reflections revealed their challenges and successes in identifying and meeting diverse learning styles of students in their field placements, and in implementing their music-integrated read-aloud activities. The instructor will revise and adjust future courses and activities accordingly based on these insights from the candidates enrolled in the course. According to Bernstein (2010), “…the best instructors in all fields are those who read what others are doing, evaluate their own successes, and refine their teaching through careful consideration of the evidence before them” (p.1).

**Extend to other Arts Areas**

The pre-service teachers, for the most part, were receptive to the music activities in which they participated. Limitation: A few expressed that they were not as comfortable in music as in other areas. In the future, the instructor plans to encourage the candidates to work in an arts area (Visual Arts, Music, Dance, and Theatre) that is most relevant to their lesson, and to capitalize on their own personal learning style, experience, and/or comfort zone. By incorporating musical, visual-spatial, bodily-kinesthetic, and other identified areas of multiple intelligence (Gardner, 1993), these pre-service teachers will be empowered to further develop their self-efficacy for teaching diverse learners through the arts.
Make Connections

In this type of study, it is practical to make connections to both teaching and research. The pre-service teachers were deemed students and teachers simultaneously, but some of them also became researchers as a result of this study.

Connection to Teaching

One of the most gratifying outcomes of this project was how the pre-service teachers connected knowledge, skills, and activities developed in their Creative Arts Methods class to their lessons in their Methods I practicum course. These connections were noted by the University Supervisors who evaluated their practicum experience lesson plans and instruction. Kindle and Schmidt (2019) made a similar analogy with the constructivist theory (Vygotsky, 1978) in their study on scaffolding: Just as working with children in their Zone of Proximal Development (ZPD), the teacher is considering them as future students; working with pre-service candidates, the instructor is considering them as future teachers. With their hands-on arts-integrated lesson planning in this project, the teacher/researcher is deeming her candidates as future successful teachers. This type of project has the potential to enrich their planning and teaching during this course and in subsequent practicum courses. Furthermore, it is hypothetical that this knowledge and skills development will extend into their future classrooms of employment. Darling-Hammond (2006) concludes that it is critical for teacher education programs to provide ample application time for their pre-service teachers to be effective. As a result of the pre-service teachers applying their creative arts skills to their language arts lessons in this project, they are now better equipped to apply these skills in future lessons in various content areas.

Connection to Research

As mentioned earlier, a product of the initial project was the excitement and desire of several of the pre-service teachers to contribute to the research by sharing the results from their respective music and literature read-aloud activities. They collaborated, under the direction of the teacher/researcher, developed a poster presentation; and very professionally represented the university as they confidently presented as Student Researchers at an International SoTL Conference (Hartman et al., 2015). This student-sharing of the results further confirms the enhancement of pre-service teachers' self-efficacy in the project!

Experience Scholarship of Teaching and Learning (SoTL)

This inquiry into the teaching and learning process with the overall intention of improving student learning (McKinney, 2007) exemplifies the SoTL reciprocal relationship. This project emanates key components of SoTL: encouraging self-reflection, examining and applying effective teaching strategies, and advancing the field of teacher education. This SoTL project is more than a model of “good teaching” for the candidates. It goes beyond the best practice of assessing students and using the results to revise instruction. It is a more systemic and reflective approach to meeting the needs of the teacher candidates, with the potential that they will glean from this model and employ similar rigor in their practice, becoming more efficacious in meeting the needs of their future students. Providing the opportunity for the teacher/researcher’s candidates to share their own experience in a professional conference boosted their confidence, allowed them to disseminate their results first-hand, and participate in discourse with other researchers—this, in turn, enhanced learning by all (McKinney, 2007; West, 2014). Broadening scholarship and leading to advancements in the professional field of

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teaching are other benefits of this project. For example, feedback from the critical peer review process further contributes to the teacher/researcher’s reflective process to enable effectual scholarly decisions for teaching and research. Further dissemination of the results from this project will illuminate the erudition of music integration and its effect on literacy and has the potential to promote the advancement of creative arts methods in teacher preparation programs in the professional field.

**Make Program Contributions**

Embracing the assertion by Bruinsma and Jansen (2010), this boost to self-efficacy has the potential to encourage pre-service teachers to stay in the profession longer—a critical performance standard measured in teacher education assessment programs. Moreover, the pre-service teacher program will glean from the data, enabling the faculty to make informed and purposeful program decisions. Ultimately, the teacher educators will be enabled to positively address the essential question, “Is a new teacher ready for the job?” (AECTE, 2023, para. 1)

**Conclusion**

This study has demonstrated that enhancing pre-service teachers’ self-efficacy during their practicum experience contributes to their confidence in teaching in their future classrooms (Dogutas, 2016; Frazier et al., 2019; Pajares, 2005). Equipping the candidates with the knowledge of what needs to be done (meeting the diverse needs of students in attention and auditory processing); developing their skills required to do it (selecting developmentally appropriate literature and honing their personal music proficiencies); and providing them sufficient practice with varied strategies (specifically, incorporating appropriate music and literature activities effectively in their ELA practicum lessons) heightens the development of their self-efficacy for teaching (Bandura, 1997; Darling-Hammond, 2006; Pajares, 2005). Finally, the aspiration of the teacher/researcher in this project was to provide opportunities in the creative arts method course for pre-service teachers to increase their self-efficacy for enhancing the literacy of their diverse learners through the use of music activities with children’s literature. It is her hope that the efficacy developed through this project will continue with the candidates throughout their program, and that it has equipped them to become successful teachers who exemplify the elementary teacher education program motto: “Reflective Educators for Diverse Learners” (COE, 2022, para. 1).
Appendix


<table>
<thead>
<tr>
<th>TEACHER BELIEFS</th>
<th>How much can you do?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Directions:</strong> This questionnaire is designed to help us gain a better understanding of the kinds of things that create difficulties for teachers in their school activities. Please indicate your opinions about each of the statements below by circling the appropriate number. Your answers will be kept strictly confidential and will not be identified by name.</td>
<td>Nothing</td>
</tr>
<tr>
<td>1 How much can you influence the decisions that are made in the school?</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>2 How much can you express your views freely on important school matters?</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>3 How much can you do to get the instructional materials and equipment you need?</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>4 How much can you do to influence the class sizes in your school?</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>5 How much can you do to get through to the most difficult students?</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>6 How much can you do to promote learning when there is lack of support from the home?</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>7 How much can you do to keep students on task on difficult assignments?</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>8 How much can you do to increase students’ memory of what they have been taught in previous lessons?</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>9 How much can you do to motivate students who show low interest in schoolwork?</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>10 How much can you do to get students to work together?</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>11 How much can you do to overcome the influence of adverse community conditions on students’ learning?</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>12 How much can you do to get children to do their homework</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>13 How much can you do to get children to follow classroom rules</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>14 How much can you do to control disruptive behavior in the classroom?</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>15</td>
<td>How much can you do to prevent problem behavior on the school grounds?</td>
</tr>
<tr>
<td>16</td>
<td>How much can you do to get parents to become involved in school activities?</td>
</tr>
<tr>
<td>17</td>
<td>How much can you assist parents in helping their children do well in school?</td>
</tr>
<tr>
<td>18</td>
<td>How much can you do to make parents feel comfortable coming to school?</td>
</tr>
<tr>
<td>19</td>
<td>How much can you do to get community groups involved in working with the schools?</td>
</tr>
<tr>
<td>20</td>
<td>How much can you do to get churches involved in working with the school?</td>
</tr>
<tr>
<td>21</td>
<td>How much can you do to get businesses involved in working with the school?</td>
</tr>
<tr>
<td>22</td>
<td>How much can you do to get local colleges and universities involved in working with the school?</td>
</tr>
<tr>
<td>23</td>
<td>How much can you do to make the school a safe place?</td>
</tr>
<tr>
<td>24</td>
<td>How much can you do to make students enjoy coming to school?</td>
</tr>
<tr>
<td>25</td>
<td>How much can you do to get students to trust teachers?</td>
</tr>
<tr>
<td>26</td>
<td>How much can you help other teachers with their teaching skills?</td>
</tr>
<tr>
<td>27</td>
<td>How much can you do to enhance collaboration between teachers and the administration to make the school run effectively?</td>
</tr>
<tr>
<td>28</td>
<td>How much can you do to reduce school dropout?</td>
</tr>
<tr>
<td>29</td>
<td>How much can you do to reduce school absenteeism?</td>
</tr>
<tr>
<td>30</td>
<td>How much can you do to get students to believe they can do well in schoolwork?</td>
</tr>
</tbody>
</table>

References


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Increasing Student Engagement with Self-Assessment Using Student-Created Rubrics

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Abstract: Self-assessment is a formative process where students evaluate the quality of their own work. This paper describes a strategy for using student created rubrics as self-assessment tools to increase student engagement. Initially, the instructor models how to identify criteria for mastery in an assignment. This is followed by students in small groups identifying criteria for mastery in their assignment. These criteria can be used to create either an analytic or holistic rubric. Students use this rubric first to practice the assessment process through peer-review, followed by self-assessing their own work. Students can also choose to conference with their instructor to discuss their feedback as well as reflect on the quality of their work. The student will then apply this feedback to their work prior to final submission.

Keywords: self-assessment; criteria-based rubric; instructor feedback; student engagement

Self-Assessment

Self-assessment is a process in which students evaluate their work to see how well it meets the criteria required for the assignment (Andrade & Du, 2007) and is a critical skill for all learners to continually improve their work (Carless et al., 2011). According to Andrade and Du (2007), the process of self-assessment begins with establishing expectations for an assignment, followed by students comparing their work to these expectations, often presented in the form of a model or rubric, generating feedback for themselves, and then applying their own feedback to improve their work. Additionally, self-assessment should be an ongoing formative assessment process (Andrade & Valtcheva, 2009). However, it can be problematic if students lack experience in self-assessment (Lew et al., 2010). Therefore, instructors need to support students understanding the connections between feedback, their work, and how those connections can help them improve their work (Quintion & Smallbone, 2010). One way to do this is to involve students in creating the assessment process and using self-assessment. This way, students independently focus on the quality of their work, rather than relying on their instructor (Andrade & Valtcheva, 2009).

Increasing Engagement with Self-Assessment

Munns and Woodward (2006) identified three behaviors of student engagement that should occur simultaneously, which are: 1) students understanding what they are learning; 2) students valuing what they are learning; and 3) students actively participating in what they are learning. Successful self-assessment increases student achievement, as well as actively involving students in their learning process (Andrade & Valtcheva, 2009), thus aligning with the behaviors of student engagement. When students engage in the process of self-assessment to create their best work, they can increase their
chances of success, leading to higher levels of self-efficacy, and thus increasing their overall engagement in the learning process (McMillian & Hearn, 2008). By involving students in the process of creating a rubric (Andrade & Valtcheva, 2009), followed by students having opportunities in class to self-assess their work (Carless et al., 2011), as well as reflecting on instructor feedback (Quintion & Smallbone, 2010), the instructor can further increase the chances of eliciting the behaviors of student engagement.

**Modeling Mastery Criteria**

The first step in preparing students to self-assess their work is for the instructor to model the process of identifying the criteria to be assessed. The instructor will use an example assignment, (preferably one like the assignment students will self-assess), and model how to identify the criteria of that assignment required to demonstrate mastery. This can include the instructor explaining what criteria are required, and how they contribute to demonstration of mastery of the assignment. This should be followed by engaging students in discussion about the importance of establishing a core set of criteria for an assignment (Inoue, 2005), while also pointing out how the means to demonstrate these criteria can vary. For example, if one of the criteria is for students to express a clear understanding of a concept or skill, this can be demonstrated in various forms; written as an essay, as a presentation, or a multi-media project.

It is important for students to understand how to monitor their progress of the assignment by focusing on their performance, then comparing it to the established criteria (Andrade & Valtcheva, 2009) to achieve mastery. The instructor should explicitly inform students this exercise is to prepare them to identify the criteria for an upcoming assignment that they will assess themselves.

**Collaboration to Identify Criteria**

At this stage, the instructor will review the assignment for self-assessment with the class and refer to the process of identifying criteria required for mastery that was previously modeled. This should include discussion on how this assignment aligns with the goals of the unit or lessons that have been taught so that students can get a clear understanding of the purpose of the assignment. The instructor will assign students to small groups, with no more than five students in a group to achieve optimal cohesion and sociability (Akcaoglu & Lee, 2016). Each group will be given time to discuss and identify the criteria for mastery. Each group will then present their criteria, with the instructor recording their responses in a medium visible to all students. The instructor can then ask students to identify the common criteria as a starting point to eventually finalize a list of the criteria for mastery. As the discussion continues, the instructor should remind students that while there may be disagreements, the class will have to eventually come to a consensus (Inoue, 2005). This process of students being involved in the creation of the rubric and identifying the criteria for mastery helps students become more familiar with the assignment (Andrade & Valtcheva, 2009).

**Rubric Creation**

Once the instructor has established a consensus among the students, they can present options in which the criteria will be presented. One option is a criteria-based analytic rubric, which focus on each criterion separately (Brookhart, 2013). The instructor can model how to create an analytic rubric for the assignment that contains individual criteria aligning to the objective of the assignment, as well as a description of performance quality of each of these criteria. This includes how to create a performance-level description for each criterion. The performance descriptions should be clear,
provide a description of the performance across a continuum of quality, be distinguishable between levels of quality, and contain a description of the assignment objective at the appropriate performance level that is easily identifiable (Brookhart, 2013). As outlined in Table 1, instructors can demonstrate point-based scores for each level of performance to easily establish an overall score and assign terms that indicate levels of proficiency. The addition of terms that indicate proficiency clarifies the quality of student work, as opposed to simply using numerical scores.

Table 1. Sample Criteria-Based Analytic Rubric.

<table>
<thead>
<tr>
<th>Criteria 1</th>
<th>Advanced (5 points)</th>
<th>Proficient (4 points)</th>
<th>Approaching proficient (3 points)</th>
<th>Below proficient (2 points)</th>
<th>Novice (1 point)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Description</td>
<td>Performance Description</td>
<td>Performance Description</td>
<td>Performance Description</td>
<td>Performance Description</td>
<td></td>
</tr>
<tr>
<td>Criteria 2</td>
<td>Performance Description</td>
<td>Performance Description</td>
<td>Performance Description</td>
<td>Performance Description</td>
<td></td>
</tr>
</tbody>
</table>

* This Table illustrates an example of a criteria-based Analytic rubric.

However, some may find creating an analytic rubric quite time consuming. Another option is a holistic rubric, see Table 2. As opposed to a criterion-based analytic rubric that contains objectives with performance levels, a holistic rubric includes all criteria to be assessed along with a performance description of each criterion (Brookhart, 2013). While this rubric does not identify specific levels of performance, it allows for evaluation of criteria, and it is less time intensive to create as opposed to an analytical criterion-based rubric. The instructor can survey students as to which rubric they would prefer, then decide if they want students to create the rubric as part of the assignment, or to create the rubric themselves using the agreed upon criteria for mastery, and then distribute it to the students.

Table 2. Sample Holistic Rubric.

<table>
<thead>
<tr>
<th>Criteria 1</th>
<th>Criteria 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Performance Description</td>
<td>• Performance Description</td>
</tr>
<tr>
<td>• Performance Description</td>
<td>• Performance Description</td>
</tr>
</tbody>
</table>

* This Table illustrates an example of a holistic rubric.

Peer-Review Practice and Self-Assessment

Initially, students will use the student-created rubric to monitor the quality of their work as they progress on completing the assignment by comparing their work to the agreed upon criteria. Once they have completed a first draft of the assignment, the instructor will pair students up to peer-review each other’s work, using the student created rubric. This will create an opportunity for students to practice assessing the assignment using the rubric, to discuss their reasoning and provide feedback to each other. Once students have practiced assessing the assignment in peer review, they will use the rubric to self-assess their work. Students will then submit their self-assessed assignment for instructor review. The instructor will provide feedback, aligning comments specifically to the rubric. The student should have the option to conference with the instructor to discuss and reflect on the feedback provided, as well as to provide a rationale to the instructor, supporting their assessment decisions.
This way, both the student and instructor can come to a consensus before the final version of the assignment is submitted and graded.

References


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