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Liminal Journeys: Autoethnography as a Gateway to Transformative Learning

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Abstract

This essay explores the deep interconnections between autoethnography and transformative learning, emphasizing the role of liminality in empowering adult learners to share their stories and experiences within their culture as they navigate transformation. It outlines a journey, segmented into the outset, midpoint, and destination, where various elements of transformative learning, autoethnography, liminality, and reflection are explored, enabling individuals to critically examine their life experiences and transitions. By engaging with liminal spaces—thresholds of transition and transformation—autoethnography enhances self-awareness, critical reflection, and the integration of cultural analysis, thereby fostering profound growth and self-discovery. This exploration highlights the utility of personal narratives in understanding and navigating complex identities and experiences, underscoring the potential of autoethnography as a methodology tool that enriches and contributes to a deeper appreciation of transformative learning processes.

Keywords: Liminality, Transformative Learning, Autoethnography, Edge-Emotions

Liminal Journeys: Autoethnography as a Gateway to Transformative Learning

Introduction

Transformative learning has always been about the profound change in how individuals perceive themselves and the world around them (Mezirow, 2000). While the value of lived experiences as a pivotal learning resource in adult education is widely acknowledged, opportunities exist to enhance the effective integration and utilization of these experiences for fostering transformative learning. One of the most potent tools to facilitate this change is through autoethnography. This essay explores the deep interconnections between autoethnography and transformative learning, emphasizing the role of liminality in empowering adult learners to share their stories and experiences within their culture as they navigate transformation. By engaging with liminal spaces—thresholds of transition and transformation— adult learners critically reflect on their past experiences, beliefs, and perceptions to enhance understanding and processing of personal lived experiences.

Outset

The early part of a journey is often referred to as the outset, which involves preparation, initial challenges, and laying the groundwork for the journey ahead. The outset allows for learning, adjustment, adaptation, and critical reflection as one navigates new information. Early steps will delve into transformative learning, autoethnography, critical reflection, and liminality, emphasizing how these elements empower adult learners to enhance self-awareness, reflection, and the integration of cultural analysis, thereby fostering transformative learning.

Transformative Learning

Lindeman (1926) believed that adults are motivated to learn from their lived experiences, and these experiences are the richest source of learning. Each adult learner brings a unique background and experiences that form a complex web of varied cognitive, sociocultural, and emotional challenges within their educational experiences and personal lives (Kasworm, 2008; Kasworm & Bowles, 2012). Due to the various elements and factors of adult learning, researchers and educators have explored and utilized transformative learning to examine how adult learners create meaning from their experiences (Kasworm & Bowles, 2012; Mezirow, 1997). Mezirow introduced *perspective transformation* in the late 1970s to help adults "learn to make their own interpretations rather than act on the purposes, beliefs, judgments, and feelings of others" (Mezirow, 1997, p. 5). The importance of *perspective transformation* to adult education is that Mezirow (1981) attempted to narrow the gap in the transition process between stages of adult psychological development in major lifespan theories. His belief in *perspective transformation* was that as adults, we are caught in our histories, reliving them, and one needs to make new meanings and interpretations regarding past experiences (Mezirow, 1978). He chose "meaning perspective to refer to the structures within which one's past experience assimilates and transforms new experience" (Mezirow, 1991, p. 42). Findings from the study described a process of *perspective transformation* that included 10 phases/stages:

1. A disorienting dilemma
2. Self-examination with feelings of fear, anger, guilt, or shame
3. A critical assessment of assumptions
4. Recognition that one's discontent and the process of transformation are shared
5. Exploration of options for new roles, relationships, and action
6. Planning a course of action
7. Acquiring knowledge and skills for implementing one's plans
8. Provisional trying of new roles
9. Building competence and self-confidence in new roles and relationships.
10. A reintegration into one's life on the basis of conditions dictated by one's new perspective. (Mezirow, 2000, p. 22)

Mezirow's (1978) foundational study introduced three essential components to the process of meaning structure transformation: individual experience, critical reflection, and rational discourse. Mezirow (1991) saw learning as the process of making assumptions explicit, contextualizing them, validating them, and acting on them. The essential dimension of transformative learning is the explicit recognition of the foundational process involving critical assessment of epistemic assumptions (Dirkx et al., 2006); thus, it offers "one of the most sophisticated conceptualizations of reflection within a larger frame of adult learning theory" (Mälkki, 2010, p. 208). Mezirow's perspective places the learners' experience as the starting point for the transformative learning process, and he used transformative learning to explain how one's expectations directly influence the meanings made from one's experiences (Taylor, 1998). The meaning-making process of transformative learning allows adults to explore the nature of knowledge to understand better how they know what they know (Merriam & Baumgartner, 2020). Transformative Learning Theory has seen continued growth across multiple fields of study and cultures with research that elaborates elements of fostering transformative education that include individual experience, promoting critical reflection, dialogue, holistic orientation, awareness of context, and authentic relationships (Mezirow & Taylor, 2009; Merriam & Baumgartner, 2020).

Autoethnography

"Autoethnography is a form of self-narrative that places the self within a social context. It is both a method and a text" (Reed-Danahay, 1997, p. 6). Ellis and Bochner (2000) refer to autoethnography as "action research for the individual" (p. 754). Autoethnography is a qualitative research approach that provides detailed, complex, and specific insight into individual lives, experiences, and relationships, offering detailed insights into phenomena and bringing to light the extraordinary and authentic aspects of these experiences within the broader societal framework (Adams et al., 2014; Ellis & Bochner, 2000).

Autoethnography goes beyond mere storytelling to enhance our comprehension of societal truths through the perspectives of researchers (Chang, 2013). Autoethnography has been used as an empirical research methodology throughout various academic fields and with academics from multiple epistemological and theoretical positions. Jones et al. (2013) identified four vital historical trends over the past 50 years that have shaped the development of autoethnography: a shift towards valuing qualitative research due to the limitations of scientific knowledge, ethical concerns in research, the crisis of representation, and the rise of identity politics and social identities. Together, these trends have significantly contributed to the evolution and practice of autoethnography, emphasizing the role of personal narrative, ethics, and identity in qualitative research. Jones et al. (2013) highlighted the shift in social science research towards questioning positivism's authority and truth claims, influenced by poststructuralist, postmodernist, and feminist critiques. Autoethnography emerged as a response, offering a method that transcends traditional empiricist approaches by emphasizing reflexivity and the researcher's voice, rooted in postmodern philosophy (Wall, 2006). Jones et al. (2013) outline five intertwined purposes of autoethnography that highlight its distinctiveness and appeal: to challenge conventional research norms and presentations; utilize insider knowledge; navigate through pain and adversity to improve life; seek to break silences and empower the voice of the researcher; and make research more accessible (Jones et al., 2013). Together, these purposes frame autoethnography as a method that not only enriches understanding of personal and cultural experiences but also transforms the practice and presentation of research.

Critical Reflection

Critical reflection is a fundamental element of transformative learning, involving examining and critiquing one's assumptions and beliefs shaped by previous experiences (Mezirow, 1990). Mezirow (1991, 1997, 2000) emphasized that this process distinguishes adult learning by enabling learners to assess the integrity and validity of their perspectives, thus leading to transformational changes in understanding and behavior. Mezirow (1998) highlighted the role of critical self-reflection in gaining emancipatory knowledge and effecting significant changes in one’s frame of reference. This form of deep self-reflection challenges deeply held presuppositions, impacting adult behavior and interaction patterns significantly (Mezirow, 1991). Bochner (2012) emphasizes that “reflection is the heart of autoethnographic storytelling” (p. 161). The effectiveness of autoethnography hinges on the depth of reflection involved (Gornick, 2008). Stories typically center on conflict, exploring emotions and choices that require elucidation and comprehension (Bochner, 2012). This investigative quality of autoethnography merges with the transformative learning process that allows for exploring, interpreting, and evaluating these elements.

Liminality

Turner (1967) first introduced the concept of liminality in relation to rituals, describing it as a threshold phase where individuals find themselves suspended between two distinct states or identities. Liminality encompasses the uncertain and transitional phase during which people have moved beyond their former state or identity but have not yet fully assumed their new one (Larson, 2014). It describes the experience of being in the transitional phase of a process, characterized by ambiguity, disorientation, and the potential for transformation as individuals navigate between their old and new identities (Larson, 2014). This notion has since been extended to various fields, including anthropology, psychology, and narrative studies, to explore the complexities of human experiences during periods of change (Larson, 2014; Turner, 1967). In transformative learning, Mälkki and Green (2014) describe the liminal zone when one is “faced with the challenge to give up one’s preconceived destination, and reliance on one’s present meaning perspective” (p. 12). In autoethnography, liminality becomes a pivotal focus, allowing for an introspective examination of personal narratives that navigate through these in-between spaces (Ellis & Bochner, 2000).

Midpoint

At the midpoint or heart of a journey, individuals may experience growth, develop resilience, and gain deeper insights or knowledge as they adapt to new challenges. However, this period marks a threshold for both disorientation and discovery, where the familiar gives way to the unknown. In this in-between state, the journey and destination blur, inviting exploration of uncharted territories within and beyond. Two distinct challenges encountered at the midpoint of this journey include navigating comfort zones and edge emotions and experiencing the threshold or transitional phase.

Comfort Zones and Edge Emotions

Scholars of transformative learning have explored the conflict learners have throughout the transformative learning process to create intense levels of reflection and learning (Cranton, 2016; Dirkx et al., 2006; Mälkki, 2012; Mälkki & Green, 2014). These new learning experiences may "challenge individuals to move beyond their comfort zone of the known, of self and others" (Kasworm & Bowles, 2012, p. 389). Challenges to one's comfort zone bring even more complexity to the adult graduate learner's identity within and outside academia, which can contain complex and powerful emotions for individuals as they confront personal and cultural elements within their identities (Cranton, 2016). Mälkki (2010) introduced the concepts of comfort zones and edge emotions to illustrate how emotions can protect existing beliefs and challenge individuals to reflect on their assumptions, suggesting that acknowledging and working with edge emotions is crucial for deep reflection. Mälkki's (2012) research on involuntarily childless women further explored how disorienting dilemmas, such as life crises, can trigger reflective processes, emphasizing the emotional complexity inherent in negotiating such experiences. Mälkki's (2019) ongoing research explores how individuals can learn to harness edge emotions effectively to enhance critical reflection and transformative learning.

Green (2012) explored the connection between trauma theory and transformative learning, proposing that transformative learning involves navigating through anxiety and depression as part of the process of personal reconfiguration. This perspective frames transformative learning as a cognitive and affective journey, incorporating the necessity of grieving within the transformational process. The research underscores the potential challenges individuals face in the liminal space between old and new ways of being, highlighting the importance of critical reflection even in times of crisis (Green, 2012). In their collaborative work, Mälkki and Green (2014; 2018) further examine the phenomena of liminality, comfort zones, and edge emotions, arguing that transformation involves navigating these emotional and cognitive challenges. They advocate for creating safe and accepting learning environments facilitating transformative dialogue and reflection, viewing edge emotions as gateways to deeper existential truths. Their contributions offer valuable insights into the complex dynamics of transformative learning, emphasizing the critical role of emotions in fostering profound, meaningful change and reflection.

Experience of Being in the Threshold/Transitional Phase

Liminality can describe any situation where individuals or groups are in a threshold of transition and transformation between two distinct phases of life or experience. This can occur during significant life events and during phases of transformative learning and personal development. Liminality is a site of transformation

> where different perspectives come into conflict and where you question the basic ideas, tenets, and identities inherited from your family, your education, and your different cultures. The zone between changes where you struggle to find equilibrium between the outer expression of change and your inner relationship to it. (Anzaldúa, 2002, pp. 548-549)

The autoethnographic journey is non-linear and requires researchers to embrace ambiguity as they navigate personal and cultural exploration (Ellis, 2004). Moving back and forth across a threshold of transition and transformation can occur throughout the autoethnographic process. Denzin (2014) suggests identifying a starting point by reflecting on life-changing experiences or everyday moments. The process does not require a profound epiphany but often begins with meaningful personal insights. Ellis (1999)

highlights that autoethnography facilitates a deeper self-understanding and, by extension, a better comprehension of others, serving as a meaningful exploration for both the individual and society. Building an interpretive community through dialogue with peers and reviewing related literature helps situate the researcher's story within existing research, filling identified gaps with their unique perspective (Adams et al., 2014).

Another threshold of transition and transformation arises when autoethnographers seek to reintegrate their unique individuality into their research (Bochner, 2013). This process emphasizes subjectivity, emotions, and the pursuit of meaning in life, highlighting the deeply personal nature of autoethnographic inquiry (Bochner, 2013). Writing plays a crucial role throughout the autoethnographic process, from initial concept to final presentation, integrating personal artifacts, cultural data, and fieldwork into a coherent narrative (Ellis, 1999; Muncey, 2010). Ellis (1999) advocates for vulnerability in storytelling, arguing that it fosters deeper reader engagement and emotional resonance. The objective is not to recount events with exact precision but to share the significance and emotional truths of those experiences, inviting readers to reflect on their own lives in comparison. Through storytelling, autoethnographers narrate their journeys and examine cultural norms, highlighting the need for reflexivity in acknowledging their perspective and biases in the narrative process (Adams et al., 2014). Writing an autoethnography close to the event allows for an authentic emotional connection, though it may challenge the researcher's ability to objectively analyze from a cultural standpoint. The subjective truth and the limitations of language mean that research stories are inherently partial and contextual. Ellis (1999) argues for a concept of validity based on verisimilitude, aiming to evoke a sense of realism and possibility in the reader and enhance communication and understanding across different perspectives. Including personal narratives, subjectivity, and reflexivity enrich research, offering valuable insights that challenge conventional scientific knowledge (Bochner, 2013).

Another threshold of transition and transformation arises in autoethnography, which, while centered on the researcher's perspectives and experiences as the primary data source, also inherently involves others and extends beyond isolation (Adams et al., 2014). Ellis (1999) highlights the challenging nature of autoethnography, including the emotional difficulties and ethical dilemmas encountered when sharing personal stories, especially those involving family and close relationships. The process demands rigorous self-examination and can expose the researcher to vulnerability, fear, and self-doubt, as it involves revealing personal flaws and facing potential judgment from readers and those included in the narrative (Ellis, 1999). The act of writing about close relationships raises ethical concerns, mainly when people prefer not to have their stories shared. This emphasizes the need for autoethnographers to consider the broader social implications of their work and the interconnectedness of their narratives with the lives of others. As they navigate their personal experiences, autoethnographers must engage in reflexivity and maintain a responsible approach toward those who become part of their story, ensuring a collaborative and ethical representation of shared experiences (Adams et al., 2014; Ellis, 1999; Muncey, 2010). This relational responsibility underlines the importance of respecting and protecting the privacy and integrity of all involved.

Destination/New Beginnings

The final part of a journey is characterized by reflection, evaluation, and, in many cases, a sense of accomplishment or realization. It is a time when the lessons learned are consolidated, and the experiences gained are integrated into one's understanding and identity. The end of a journey might also prompt consideration of future paths, setting the stage for new beginnings.

Lessons Learned

Ellis (2004) sees the use of personal narratives to help understand oneself or some aspect of life as it intersects with a cultural context. Within this cultural context, the research can connect “to others and invite readers to enter the author’s world and to use what they learn to reflect on, understand, and cope with their own lives” (Ellis, 2004, p. 46). The use of Transformative Learning Theory as a theoretical lens for an autoethnographic approach enhances the reflection of the researcher. Within transformative

learning and autoethnography, much of the research and practice lies in individuals' social relationships, dialogue, and storytelling (Cranton & Merriam, 2015). An autoethnography is "particularly well suited for the study of transformative learning because it allows people to convey their personal experience of this type of learning through stories" (Merriam & Kim, 2012, p. 63). The value of personal storytelling within autoethnographic explorations attempts to "insert what is unique about a person back into the human sciences…highlighting subjectivity, feeling, empathy, authenticity, intimacy, death and dying, and everything involved with finding meaning in life" (Bochner, 2013, p. 51). Engaging in autoethnographic writing can help one better understand the dynamic, transformative process and how it has been shaped by one's cultural contexts (Nogueiras et al., 2019; Taylor & Cranton, 2012). The autoethnographic approach to transformative learning explores not only pre-existing cultural influences but also examines cultural aspects surrounding the development of identity, reflects on how to be successful in the classroom, and mentally manage various circumstances surrounding one's life (Kasworm, 2008; Nogueira et al., 2019).

Crafting a personal narrative or autoethnographic account can illuminate the milestones and obstacles encountered throughout the transformative learning journey. This includes navigating through disorienting dilemmas, engaging in introspective analysis of feelings and emotions, critically evaluating one's assumptions, recognition of discontent, exploring new roles and relationships, planning a course of action, acquiring new knowledge and skills needed for new courses of action, trying new roles, building competence and self-confidence in new roles and relationships, and reintegration into one's life with new perspective (Mezirow, 2000). The ongoing development of one's narrative can push individuals to extend beyond their familiar boundaries and comfort zones, encouraging them to explore the nuances of their identities and relationships (Kasworm & Bowles, 2012). This process enables individuals to navigate liminal spaces, engaging with emotions at the edge of their experiences. Crafting personal narratives allows individuals to process and fully comprehend experiences that are initially disorienting and share their emotional vulnerabilities, prompting them to venture into experiences that challenge their usual comfort zones, thereby facilitating deeper insight and meaning-making within the transformative learning process (Mälkki & Green, 2014, 2018).

Future Paths (Implications)

Integrating autoethnography into transformative learning theory and practice holds significant implications for adult education. It offers a methodology that emphasizes personal experience, critical reflection, and cultural analysis. Strategies and tools that facilitate autoethnographic writing and storytelling include personal narratives, reflective journals, digital storytelling, forums, support groups, critical incident analysis, and mentoring. Integrating autoethnographic-focused activities can enhance educational practices by encouraging learners to become co-creators of knowledge and fostering an inclusive, reflective, and transformative learning environment. Adult educators must avoid oversimplifying or generalizing interactions with adult learners when fostering transformative learning. For educators, adopting autoethnographic methods can lead to more empathetic and culturally responsive teaching practices, ultimately contributing to a more engaging and meaningful educational experience for adult learners (Bochner & Ellis, 2016; Ellis, 1999). Writing an autoethnography shortly after a significant event offers the advantage of directly accessing and articulating the emotions tied to that experience, which aligns with transformative learning theory's emphasis on critical reflection and personal growth. However, the intense emotional involvement may also pose a challenge, potentially limiting the researcher's capacity to objectively analyze the cultural implications of their experience. This dynamic interplay between deeply personal introspection and broader cultural analysis is essential for producing meaningful autoethnographic work. It mirrors the transformative learning process, where engaging with personal experiences deeply catalyzes a broader understanding of societal contexts (Adams et al., 2014; Ellis, 1999; Jones et al., 2013).

Ellis (1999) shared some concerns about the use of autoethnography, "honest autoethnographic exploration generates a lot of fears and self-doubts and emotional pain. Then there is the vulnerability of revealing yourself and the ethical issues involving others" (p. 672). Autoethnography as a gateway to

transformative learning highlights the importance of a theoretical framework created within adult learning that provides the needed reflective lens on one's experiences in hopes of getting the most honest reflections of heightened self-reflexivity (Anderson, 2006; Ellis, 1999; Ellis & Bochner, 2000). Autoethnography encourages individuals to delve into personal narratives, fostering self-awareness and critical reflection, key components of transformative learning. Through the process of writing and analyzing their own stories, adult learners can challenge and reframe their perspectives, beliefs, and assumptions, leading to profound personal growth and transformation. Storytelling and personal narratives are central to autoethnography and transformative learning as powerful tools for reflection and insight. These narratives allow individuals to construct and reconstruct their identities and understandings of the world. Through storytelling, learners can connect individual experiences to broader social and cultural contexts, enabling a shift in perspective essential for transformative learning. Personal narratives provide a means to explore and make sense of life's complexities, facilitating deeply personal learning yet universally relevant (Muncey, 2010).

The growing popularity of autoethnography as a method and its use throughout several academic fields has helped create a diverse methodology. As a research methodology, autoethnography positions the researcher as the central narrator and primary data source. However, it is essential to acknowledge that autoethnography, similar to adult learning, does not occur in isolation (Ellis, 1999; Merriam et al., 2007). For autoethnographic research and transformative learning, the essential aspects of reflexivity and vulnerability must be used throughout to maintain a relationally responsible approach that is collaborative, committed, and reciprocal and safeguard those who are a part of the research (Adams et al., 2014).

Conclusion

Autoethnography offers an approach to foster deeper investigation into how personal narratives, especially those navigating the liminal spaces of transition and transformation, can be harnessed to enhance the transformative learning process, thereby enriching the educational journey of adult learners by delving into the complexities and nuances of their in-between experiences. Denzin (2014) emphasizes the transformative potential of autoethnography, suggesting that it can foster a deeper understanding of oneself and one's place in the world. In autoethnography, liminality becomes a pivotal focus, allowing for an introspective examination of personal narratives that navigate through these in-between spaces. Bochner and Ellis (2016) articulate that autoethnography bridges the gap between the personal and the cultural, enabling researchers to delve into their own stories to uncover broader social and cultural insights. Through the lens of liminality, autoethnographers can explore moments of uncertainty, transition, and transformation, shedding light on the processes of becoming and unbecoming that define human existence. Exploring liminal spaces in autoethnography is not merely an academic exercise but a journey of self-discovery and growth. By engaging with their own experiences of ambiguity and change, autoethnographers offer a unique perspective on the human condition, highlighting the fluid and dynamic nature of identity and experience. Autoethnography represents a powerful tool for exploring the rich tapestry of human experience. By focusing on their narratives' transitional and transformative aspects, autoethnographers provide valuable insights into the complexity of life's journeys. The interconnections between autoethnography and transformative learning and the role of storytelling and narratives in facilitating profound personal and educational change can provide a gateway to a deeper appreciation for the intricate processes of change, growth, and self-discovery that characterize our existence.

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Transformative Education Framework Applying the Results of a Qualitative Study of Transformative Learning Concepts

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Abstract

This article presents the results of a study of the frequency of concepts contained within definitions and understandings of transformative learning. The results reveal that some concepts are addressed with greater frequency than others, highlighting the centrality of these concepts for transformative learning. Based on these concepts, a Transformative Education Framework (TEF) is developed. This framework can be used to guide the development of transformative learning programs. A case example applying this framework to such a program at a regional mid-sized university along with the impact of this program on student retention and achievement is presented. The impact of this program is found to be statistically significant, lending support for the TEF as a practical and theoretical model. This article closes with a brief discussion of some of the limits of this study, the TEF, and its applications.

Keywords: Transformative Education, TEF, Transformative Learning, Mezirow

Transformative Education Framework
Applying the Results of a Qualitative Study of Transformative Learning Concepts

Introduction

Transformative learning has been defined in many different ways, with several typologies and assessment instruments that show the breadth of the diversity of understandings about transformative learning (e.g., Cox, 2021; Hoggan, 2016; Illeris, 2004; Stuckey et al., 2013; Tsimane & Downing, 2020; Walker, 2018; Wiley et al., 2021). In spite of these frameworks, transformative educators continue to struggle with definitions of transformative learning as well as frameworks that can guide teaching practice (Tsimane & Downing, 2020). One of the challenges of the topologies that have been compiled is that they do not document the frequency of concepts that are being used to describe transformative learning. Doing so could help transformative educators to better understand which terms and concepts are most central for transformative learning processes.

This article presents the results of a study of the frequency of concepts contained within definitions and understandings of transformative learning. Definitions of transformative learning from a sample of 37 articles from the past 20 years. These articles were selected by searching for those that addressed "transformative learning theory" and "transformative learning assessment." These articles represent 53 different contributors from 42 different institutions spanning 4 different continents (with more than 80% being from North America). From these articles, 435 separate statements were coded resulting in 308 individual concepts about transformative learning. These statements about transformative learning were coded using qualitative software, following a qualitative coding method known as Content

Analysis. Each of these concepts was assigned a separate code and the statements about transformative learning were coded for each separate concept. Overall, 1,653 separate codes were compiled providing insights into the frequency with which each of the 308 different concepts about transformative learning was used. The different concepts were then grouped into similar major themes, and the frequency of coding was recorded for each of these major transformative learning themes.

The results reveal that some concepts are addressed with greater frequency than others, highlighting the centrality of these concepts for transformative learning. Based on these concepts, a Transformative Education Framework (TEF) is developed. This framework can be used to guide the development of transformative learning programs. A case example applying this framework to such a program at a regional mid-sized university along with the impact of this program on student retention and achievement is presented. The impact of this program is found to be statistically significant, lending support for the TEF as a practical theoretical tool. This article closes with a brief discussion of some of the limits of this study, the TEF, and its applications, leading to suggestions for further research.

Major Transformative Learning Themes

Nine major themes were identified from among the 308 different concepts about transformative learning. The following are these major themes along with the frequency of codes for each one. These major themes, and their associated sub-themes, are listed in the order of their frequency of coding from most numerous to least:

Worldviews, Meaning Perspectives (21% of codes)
- Sub-themes: Assumptions-Expectations, Frames of Reference, Values-Attitudes, and Beliefs

Ways of Knowing-Experiencing (18%)
- Sub-themes: Cognitive-Rational, Emotional-Affective, Extra-Rational, and Experiences-Prior Learning

Critical Reflection (14%)
- Sub-themes: Reflecting, Assessing, Examining, and Elaborating

Acting-Engagement (11%)
- Sub-themes: Social Action, Behaviors-Habits, New Perspectives Guide Actions, and Self-Directed Actions

Types of Transformation (10%)
- Sub-themes: Constructing New Worldviews, Altering Existing Worldviews, Expanding Existing Worldviews, and Reaffirming Existing Worldviews

Social Aspects of Learning (8%)
- Sub-themes: Rational Discourse and Dialogue, Relationships, Cultural Transmission, and Collaborative Learning

Identity (6%)
- Sub-themes: View and Sense of Self, Way of Being, and Whole Person

Characteristics of Transformation (6%)
- Sub-themes: Phases-Stages, Structural Adaptability, Depth and Breadth of Change, Relative Stability, and Inherent Goodness

Disorienting Dilemmas (5%)
- Sub-themes: Causes (Triggering Events) and Effects (Disequilibrium)

As may be noted, concepts related to Worldviews and Meaning Perspectives were coded the most while concepts related to Disorienting Dilemmas were coded the least number of times. This list therefore provides new insights into which major themes are being addressed more or less often in the literature on transformative learning. This information can be useful in providing guidance for transformative educators who are working to define and apply transformative learning in their local context. Using this list, one can ensure that their locally developed definition of transformative learning at least addresses the

major themes that are being used most often in the literature. For instance, one might choose to develop a definition of transformative learning that addresses the top five major themes. Doing so can help to ensure that one's understanding of transformative learning aligns with the literature in this field. Overall, then, this pilot study provides helpful insights into the frequency with which concepts about transformative learning occur.

We might also note how these major themes and sub-themes compare with other typologies for transformative learning. For instance, one of the most widely referenced typologies is the one developed by Hoggan (2016). In this article, Hoggan identifies six major areas of transformative learning, each with their own sub-themes. Comparing Hoggan's areas with the major themes listed above, it might not seem that there is much similarity between these two systems. However, comparing the sub-themes for both systems reveals much overlap. Hoggan's areas and their corresponding sub-themes are as follows: Worldview (Assumptions, Beliefs, Attitudes, Expectations; Ways of Interpreting Experience; More Comprehensive or Complex Worldview; and New Awareness / New Understandings); Self (Self-in-Relation; Empowerment / Responsibility; Identity / View of Self; Self-Knowledge; Personal Narratives; Meaning / Purpose; and Personality Change); Epistemology (More Discriminating; Utilizing Extra-Rational Ways of Knowing; and More Open); Ontology (Affective Experience of Life; Ways of Being; and Attributes); Behavior (Actions Consistent with New Perspective; Social Action; Professional Practices; and Skills); and Capacity (Cognitive Development; Consciousness; and Spirituality). This study therefore serves to further confirm these types of typologies for transformative learning. However, it also extends them by identifying the number of times that the various major themes are addressed in the literature. Doing so can help theorists and practitioners to ensure that they are addressing the more commonly utilized transformative learning themes in their work.

Exploring the Major Themes in More Detail

Each of these major themes has several sub-themes that are associated with them. This section provides a brief overview of these sub-themes in order to help better understand the major themes. These sub-themes are therefore intended to further clarify what the many different understandings of transformative learning encapsulate. Doing so may then help readers to better understand the Transformative Education Framework that is described in the next section.

Worldviews, Meaning Perspectives

This major theme includes four sub-themes: Assumptions-Expectations, Frames of Reference, Values-Attitudes, and Beliefs. Transformative learning involves a shift in the assumptions and expectations that students have. As described by King (2004), transformative learning can sometimes result in a critical evaluation of these deeply rooted structures resulting in significant changes to them. Similarly, changes to one's frames of reference, which are described as the "the very structure of how one makes sense of the world," can result in changes that affect some of the other areas discussed below, such as one's actions (Kwon et al., 2021, p. 461). Transformative learning is also described as having the potential of impacting student's values. For instance, Miles (2002) discusses how personal and social change are deeply interconnected and can result in the development of more life-centered values. Finally, this major theme includes understandings of transformative learning that results in students' "profound re-assessment of beliefs" (Cox, 2021, p. 385). Collectively, these sub-themes provide a deeper understanding of the kinds of transformations that are associated with Worldviews and Meaning-Making Perspectives.

Ways of Knowing-Experiencing

This theme includes the following sub-themes: Cognitive-Rational, Emotional-Affective, Extra-Rational, and Experiences-Prior Learning. As summarized by Mezirow, transformative learning involves a "rational process of learning within awareness [which] is a metacognitive application of critical thinking that transforms an acquired frame of reference" (Dirkx & Mezirow, 2006, p. 124). Such cognitive-rational processes, asserts Snyder (2008, p. 166), has a potential "which moves the individual to higher stages of conscious development." Others extend these processes to also include emotional-affective aspects. As

Malkki (2010, p. 56) explains, "a prerequisite to becoming aware of and assessing the problematic assumptions in reflection, one needs to recognize and accept the edge-emotions, so as to become aware of, assess, and explore their bases." An individual's ways of knowing and experiencing are also asserted to involve extra-rational elements, which can involve emotional processes but also "imaginal, spiritual, and arts-based facets of learning, those that reach beyond rationality" (Stuckey et al., 2013, p. 213). Finally, this major theme includes the prior experiences and learning that students come to the learning environment with. As Taylor and Cranton (2013) explain, these experiences form an integral part of transformative learning processes and how new learning experiences are interpreted. Transformative learning is therefore conceived of as a holistic engagement with one's ways of knowing and experiencing.

Critical Reflection

This major theme includes the following sub-themes: Reflecting, Assessing, Examining, and Elaborating. In the transformative learning literature surveyed, critical reflection refers to a cluster of different approaches to this. As reflection, Henderson (2002, p. 202) summarizes Mezirow's view of reflection as involving "(a) content reflection, which is an examination of the content or description of a problem; (b) process reflection, which involves checking on the problem-solving strategies being used; and (c) premise reflection, which takes place when the problem itself is questioned." Others, such as Taylor (2001), depict critical reflection as a process of assessing and reconfiguring the origins of one's meaning structures. Similarly, Cranton (2002) asserts the necessity of critical examination of limiting or distorting views. Still others claim that transformative learning involves an elaboration of our understandings of relationship with others and the world (Dirkx & Mezirow, 2006). As one of the major themes of transformative learning, critical reflection involves a variety of different types of processes.

Acting-Engagement

This major theme involves the following sub-themes: Social Action, Behaviors-Habits, New Perspectives Guide Actions, and Self-Directed Actions. As social action, transformative learning can occur as people engage in community-based projects, such as graffiti art, that are intended to impact the wider community (Fisher-Yoshida & Lopez, 2021). Action and engagement can also support transformative learning, asserts Taylor (2001), as people develop new behaviors and habits that work to reshape their meaning perspectives. The reverse can also occur, where new perspectives result in changes to how one acts in the world (Tsimane & Downing, 2020), possibly bringing about "altered or new ethical consciousness and practice" (Patterson & Munoz, 2015, p. 315). This major theme also includes conceptions of transformative learning that are fostered by the goal setting and regulation aspects of self-directed actions (Fook & Sidhu, 2013). Similar to the critical reflection theme, then, there are several different ways that this practical action-engagement relates to transformative learning.

Types of Transformation

This major theme includes the following sub-themes: Constructing New Worldviews, Altering Existing Worldviews, Expanding Existing Worldviews, and Reaffirming Existing Worldviews. These four types of transformation are somewhat similar to the ones outlined by Brock (2010): elaborating existing frames of reference, learning new frames, transforming points of view, and transforming existing habits of mind. In constructing new worldviews, transformative learning can result in dramatically new ways of perceiving the world (Calleja, 2014). In some cases, for instance, such transformations can result in groups recreating themselves in novel ways (London & Sessa, 2006). In altering existing views, one can engage in "questioning, scrutinising, breaking down and interpreting [existing] knowledge" which results in deeper levels of understanding of one's current views (Tsimane & Downing, 2020, p. 93). Alternatively, one can expand their worldviews through an "integration of one's inner and outer worlds, a more whole person, greater self-awareness, and greater authenticity" (Hoggan, 2016, p. 61). Finally, one can reaffirm existing worldviews as part of transformative learning process, which can seem counter to many views of transformative learning. In response, Lange (2012) asserts that such reaffirmations are transformative for indigenous communities who are seeking to reaffirm native heritages in the midst of

non-native dominant cultures. Transformative learning literature therefore depicts several different types of transformation.

Social Aspects of Learning

The sub-themes include Rational Discourse and Dialogue, Relationships, Cultural Transmission, and Collaborative Learning. As defined by Mezirow (2000, p. 10-11), "Discourse…is that specialized use of dialogue devoted to searching for a common understanding and assessment of the justification of an interpretation or belief." In a study by Caruana et al. (2015), it was found that 40% of people experiencing transformative learning did so via verbally discussing assumptions/beliefs/values with someone else. It can therefore be asserted that relationships can play a significant role in transformative learning processes. In the Transformative Learning Maturity Model developed by Barker (2020, p. 18), for instance, one of the higher levels includes "inclusive, reflective, and embedded in networks of collaborative learning and sharing of narratives." Furthermore, some of the most significant relationships in our lives can result in cultural transmission. Some of these complex cultural archetypes are transmitted unconsciously (Gozawa, 2009) and need to be critically examined and deconstructed (Torrance, 2012). Collaborative learning can be central to these processes enabling students to re-see transformative experiences (Heddy & Pugh, 2015). The literature, therefore, presents the importance of the social aspects of learning as being a central part of transformative learning.

Identity

The sub-themes include View and Sense of Self, Way of Being, and Whole Person. Changes to one's identity can be one of the transformations that people experience. Defining self as a central psychological structure that "collects and holds together the outcomes of important learning," Illeris (2014, p. 151) asserts that transformative learning can result in a reorganization of this centralized self. Similarly, Hodge (2019) posits transformative learning as a liberation of one's limited ways of being in the world. Finally, authors like Romano (2018, p. 60) connect transformative learning with more holistic views of the person, including "emotive, imaginal, spiritual…personal, intuitive, and imaginative ways of knowing that lead to individuation." This major theme therefore includes those concepts that focus on more holistic and centralized aspects of one's identity.

Characteristics of Transformation

The sub-themes include Phases-Stages, Structural Adaptability, Depth and Breadth of Change, Relative Stability, and Inherent Goodness. The characteristics of transformation addressed by these articles include a number of key insights. Several sources, such as Nohl (2015), provide a summary of Mezirow's stages of transformation. Wiley et al. (2021) explore some of the impacts of transformative learning as structural adaptations such as changes to epistemic beliefs and the development of cognitive abilities. Others describe transformations in terms of breadth and depth, with depth referring to the "degree to which it affects any particular type of outcome" and breadth being related to the "number of contexts in which a change is manifest" (Hoggan, 2016, p. 71). O'Sullivan (2003, p. 327) affirms the structural shifts in consciousness and goes on to argue that such transformation "irreversibly alters our way of being in the world." Finally, Taylor and Cranton (2013) as well as Naughton and Schied (2010) emphasize the importance of considering whether the transformations are inherently good or not, asserting that transformative learning processes can potentially lead in either of these directions. These sub-themes therefore provide an overview of some of the core characteristics of transformative learning.

Disorienting Dilemmas

This includes the following 2 sub-themes: Causes (Triggering Events) and Effects (Disequilibrium). While disorienting dilemmas are sometimes described as major events in one's life resulting in challenges to one's assumptions (Walker, 2018), they are also described as "the continual encounter with a multitude of minichallenges" (Newman, 2012, p. 44). In this vein, Cranton, for example, indicates that a disorienting dilemma might be triggered by something "as ordinary as an unexpected question" (2002, p. 64). While some of these disorientations can be expected, others can create

disequilibrium due to their unpredictability (Alhadeff-Jones, 2012). Such disequilibriums can, as Buechner et al. (2020, p. 87) asserts, create liminal experiences that "leave individuals betwixt and between." Such are some of the descriptions of disorienting dilemmas described in the transformative learning literature.

Towards a Transformative Education Framework (TEF)

With the major themes of transformative learning concepts identified, along with brief discussions of their sub-themes, transformative educators might benefit from a framework that can help to guide their program development efforts. It is important that any such frameworks or topologies address the more numerously referenced major themes. The following is one proposed way to combine and organize each of the major themes above (Figure 1):

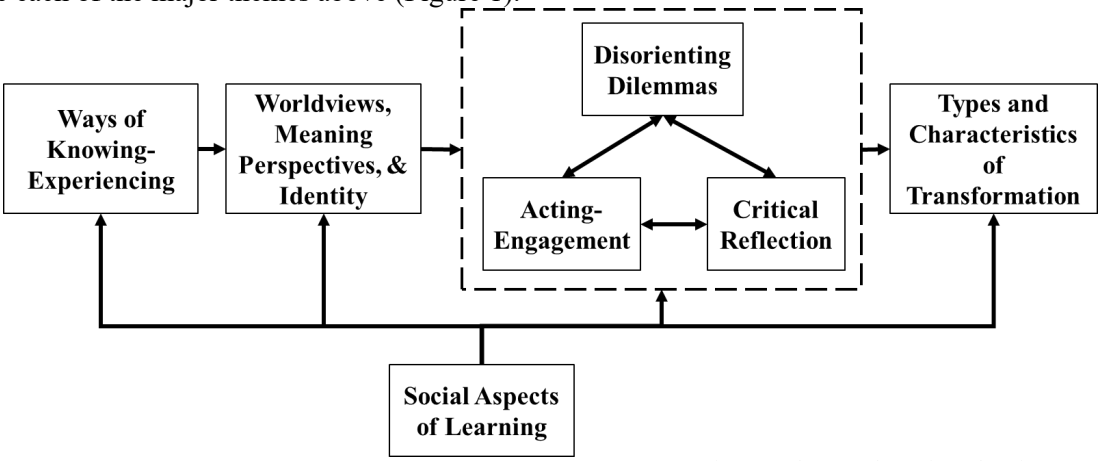

Figure 1. The Transformative Education Framework.

This Transformative Education Framework (TEF) can be used to help guide the development of transformative learning focused programs. Beginning with Ways of Knowing-Experiencing, instructors can seek to better understand students and their backgrounds in terms of their Cognitive-Rational, Affective-Emotional, and Extra-Rational capabilities. In addition, they can work to activate students' Experiences-Prior Learning as it relates to course concepts and skills. Such background knowledge and priming can help instructors to better adapt educational experiences to support transformative learning processes.

Central to transformative learning, of course, are concepts related to Worldviews, Meaning-Making Perspectives, and Identity. As described above, these concepts include students' Assumptions-Expectations, Frames of Reference, Values-Attitudes, and Beliefs. Instructors need to recognize that these have been and continue to be formed by students' Ways of Knowing-Experiencing. Based on what instructors have learned about students' Ways of Knowing-Experiencing, then, they can more directly relate course concepts and skills to students' Worldviews, Meaning-Making Perspectives, and Identity. In doing so, they will be supporting transformative learning processes as they engage with the program. However, this raises the question of what kinds of engagement might be best suited to support and help foster transformative learning processes. According to this study, three major themes emerged: Disorienting Dilemmas, Critical Reflection, and Acting-Engagement. For Disorienting Dilemmas, instructors can use their knowledge of students' Ways of Knowing-Experiencing to select activities, case examples, etc., that are more likely to create a Triggering Event that results in a Disequilibrium. Such Disequilibrium will likely occur with one or more of students' Worldviews, Meaning-Making Perspectives, and/or aspects of their Identity. In response, the instructor can then develop Critical Reflection processes that help to guide students towards reorientation and reintegration of the Worldviews, Meaning-Making Perspectives, and/or aspects of their Identity that have been disoriented. Such reorientation and reintegration can be further aided by Acting-Engagement. To do so, instructors can therefore develop projects that have students apply what they are learning to real-life situations. Students

can learn from these types of experiences the benefits of changing their existing Worldviews, Meaning-Making Perspectives, and/or aspects of their Identity in order to better respond to real-world applications. Instructors can also benefit from understanding the Types and Characteristics of Transformation. As noted above, transformations to students' Worldviews, Meaning-Making Perspectives, and/or aspects of their Identity can take the following forms: Constructing New Ones, Altering Existing Ones, Expanding Existing Ones, and/or Reaffirming Existing Ones. Transformative learning literature has also addressed characteristics of transformation such as it relates to Phases/Stages, Structural Adaptability, Depth and Breadth of Change, Relative Stability, and Inherent Goodness. With this knowledge, instructors can be in a better position to understand the kinds of transformations that each student might be experiencing and therefore better support these processes as they unfold.

Finally, this study has revealed that instructors need to understand how the Social Aspects of Learning can affect each of the other TEF areas. As outlined above, these aspects include Rational Dialogue and Discourse, Relationships, Cultural Transmission, and Collaborative Learning. Clearly, Rational Discourse and Collaborative Learning strategies can be integrated into the Disorienting Dilemma, Critical Reflection, and Acting-Engagement activities. Relationships and Cultural Transmission influence what happens in transformative learning programs but also impact students' Ways of Knowing-Experiencing as well as their Worldviews, Meaning-Making Perspectives, and Identities. Instructors therefore need to better understand how these Social Aspects of Learning are influencing student transformation as well as the educational processes of which they are a part.

The TEF can therefore be used to help guide the development of transformative learning programs. Each step of the program development process can be informed by the TEF and should result in greater insights into student backgrounds and contexts. This information can then be used to develop the activities utilized in one's programs.

The TEF in Practice: A Case Example

While the brief explanation of the TEF above may be helpful as a general guide, questions can remain as to how to implement the TEF in practice. This second half therefore provides a case example for how the TEF is reflected in the development of a transformative learning program at a mid-sized regional university in the mid-west of the United States.

One criticism Transformative Learning (TL) has faced regarding its suitability as instructional practice is that there is still uncertainty about what it looks like in practice (Taylor & Snyder, 2012). The authors of this article suggest that such uncertainty is because, even to this day, there have been few instances of TL at institution-wide implementation in both the curriculum and the co-curriculum (King & Wimmer, 2020).

Other reasons given for why TL is inappropriate or impossible at institutional scale are recounted by ŞAHIN and DOĞANTAY (2018). They describe objections raised which assert that transformation must exist at the personal or individual level, and that while "formal and institutional settings have attempted to introduce elements of transformational learning, transformative learning is mainly regarded as learning theory used in non-formal settings" (pp. 107-108).

The case example presented here argues against those who hold the opinion that TL cannot be implemented at scale in an institution of higher education. The case example also briefly describes the structure, processes, and outcomes for TL as the signature instructional approach in place for more than eight years at University of Central Oklahoma (UCO), known as the Student Transformative Learning Record (STLR) initiative. While the description pertains to UCO, the same structure and processes for institution-wide TL have been successfully adapted at other institutions, including the largest university in Ireland (Technological University Dublin, n.d.) and a 30,000-student university in Brazil (Mackenzie University, n.d.).

Importantly, the case example demonstrates TL's efficacy on a number of metrics: retention, academic achievement, and positive impact on student success and faculty self-conceptions regarding their teaching (King & Wimmer, 2020; and Ellis, 2021; among others as shared at

https://blogs.uco.edu/stlr/publications-featuring-stlr/, where retention and other data and analyses are also accessible).

Briefly, STLR engagement correlates with a 15% improvement in retention from entry to sophomore year census date and a half-letter grade increase in GPA (see STLR analytics at the link immediately above; also, King, 2021; King & Wimmer, 2020). Because STLR reflective narratives occur as part of classwork, there is no self-select or opt-in mechanism at play; all students in the class, regardless of academic or other profile, create narratives. Careful analysis each year of STLR implementation has also shown strong positive impact on the university's at-promise student population (i.e., low-income, first-generation, and underrepresented students).

The TL implementation put forth in the case example evolved within the Disorienting Dilemma, Critical Reflection, and Acting-Engagement activities cycle as described in the TEF. The other components of the TEF were quickly recognized, however, as the institution conducted mixed-methods research to examine the impact of the TL approach on students and faculty. Importantly, the ongoing collection of student reflective narratives comprises a rich database describing the impact of TL on students, their perspectives, and their expanding sense of self and worldview as prompted by critical self-reflective narratives generated as part of curricular and co-curricular activities.

Student narratives as well as the statements made by faculty in survey responses — along with one-on-one and small group interviews of both faculty and students — yield clues to the various social aspects of learning as described above in the TEF. In particular, changes in students' ways of knowing, shifts in their worldviews and perspectives, and the varieties of ways they experience TL are reflected in these narratives. UCO will soon surpass 65,000 such narratives, with analysis of narratives in place since early in STLR's history.

Transformative Learning at Institutional Scale

Undertaking an institution-wide implementation to adopt TL as a focus for pedagogical/andragogical practice requires a strong rationale given the many challenges — structural, technological, political, training, buy-in, and others. In UCO's case, that rationale lived in its mission, which in the 2008-2009 academic year introduced the phrase "transformative education" into the mission statement and also defined a group of key central tenets within which its students would develop: Disciplinary Knowledge; Global and Cultural Competencies; Health and Wellness; Leadership; Research, Creative, and Scholarly Activities; and Service Learning and Civic Engagement. The impetus to move the institution in this direction developed over time in the months preceding the mission statement change as the President's Cabinet considered implications for higher education as communicated in Learning Reconsidered and Learning Reconsidered 2 (Keeling et al. 2004, 2006).

An important factor prompted President's Cabinet considerations over time leading up to the evocative discussions built around the ideas found in Keeling et al.'s work. Institutional leadership realized that beginning in the late 1990s, student success initiatives had begun cropping up around campus, sometimes connected to some larger initiative, sometimes not. The American Democracy Project was an example, as were the Peer Health Mentors Program and work to formalize an undergraduate research focus and program. These disparate programs were all laudable and focused on helping students succeed, but Cabinet realized the need for a conceptual organizer under which these initiatives would logically fit (Cunliff & King, 2018). At one time, there were 21 such student success initiatives in place. In a self-discovery process that pulled together the need for a student success activities conceptual organizer, early thinking about what that organizer might be as prompted by Cabinet discussions and the development of what the institution called its Central Tenets, the focus on TL as a signature educational practice was adopted.

The important groundwork to stake out Transformative Learning as the philosophical foundation for education at the university thus had a rationale. Over the years that followed, however, the institution struggled to define how TL was defined inside and outside the classroom, how student growth within the key central tenet areas could be documented, and what kind of system could be devised as a system of record.

In 2012, academic leadership reformulated the teaching center operation and tasked the new, incoming center director with "operationalizing TL" at the university. In one of multiple ways leadership emphasized the university's commitment to TL, the new name of the former Faculty Enhancement Center became the Center for Excellence in Transformative Teaching and Learning. Development of what became STLR began in February 2012.

Designing, Building, and Implementing STLR

It was a focus on key aspects of Mezirow's TL theory (Mezirow, 2000) that situated UCO's design focus for what became STLR within the TEF's Disorienting Dilemmas ↔ Critical Reflection ↔ Acting-Engagement nexus. The institution had identified the developmental areas (its central tenets) within which it wanted students to expand their perspectives in service to better outcomes for themselves and those around them. This work entailed applying TL to the curriculum and the co-curriculum. Though early work had already begun before UCO detailed its operational definition of TL, the two-pronged definition helped characterize what UCO wanted TL to do in terms of student outcomes, which was Transformative Learning understood as developing students' beyond-disciplinary skills, and expanding students' perspectives of their relationships with self, others, community, and environment (Kilbourne, 2017).

The first component in the definition above focuses on the development of what might in some contexts be called "soft skills," "graduate attributes," or "institutional learning outcomes." In addition, helping students develop critical self-reflective skills was seen as an important step along a path that has graduates able to work on teams with people who disagree with them, or solve ill-formed problems within collaborative environments, or lead when the situation demands — all attributes that employers, friends, family, and the community desire. These skills are developed within a social milieu, which is one way that STLR's development reflects what is posited here as the TEF.

The second part of the operational definition hews to Mezirow's characterization of critical self-reflection as the triggering process for TL (Mezirow, 1990). In addition, Brookfield's (2016, p. 13) description of a critically reflective human also characterized what UCO wanted to accomplish with students' development within the central tenets, which is "one who constantly seeks out new information, new understandings of existing practices, and new perspectives, so that she can identify her blind spots." Improved learning outcomes accruing to students reflecting on their learning experiences (Di Stefano et al., 2014) was also recognized as a benefit of student reflective practice.

Whether the university had been successful or not in winning a U.S. Department of Education Title III grant to support scaling STLR, the focus of the project was always on improving student success, including the success of at-promise populations. Designing STLR, therefore, occurred with student success outcomes and strengthening the institution's programs overall in mind, as characterized within the grant application. Ultimately, UCO was awarded a $7.7M Title III grant (Houts, 2014).

Introducing disorienting dilemmas that could prompt critical reflection was a new skill for most faculty and staff. Training was necessary for this and as well as in utilizing the technologies that STLR staff developed. There would then be the necessity of assessing STLR impact on students, faculty, the institution, employers, and the community, along with devising the processes and structures to document this kind of development.

To consider and develop these necessities, UCO convened a STLR Project Team comprised of individuals from all over campus: faculty, Student Affairs, staff, information technology, student housing, and others. An institution-wide implementation would require an institution-wide task force to design what became STLR and determine how to operationalize the technology, training, infrastructure, processes, and other considerations. In short, the STLR Project Team had to figure out the "process, tools, infrastructure, training, and technology that allow faculty and staff to intentionally design, track, and assess activities in both the curriculum and the co-curriculum to help students achieve transformative realizations" (King, 2018). There was also a need to do so in a manner that would produce documentation that students could use in formative and summative ways to track their own growth toward the skills, values, and mindsets that make them valuable contributors in the workplace, family, and community.

The STLR Project Team had multiple priorities. One was to take the least expensive route whenever possible without compromising form or function beyond reasonable considerations. As a result, the Team worked to make the Learning Management System (LMS) the system of record for students' development within the five areas that STLR was designed to track. STLR's ultimate implementation involved the creation of a data hub that integrated inputs from the LMS and the Student Information System. Because STLR needed to track student engagement in "STLR-tagged" co-curricular activities, there was also the need to custom code a mechanism that would enable a student ID card-swipe input to connect to the LMS. In this manner, student co-curricular engagement with any of the STLR areas could be tracked in the LMS, just as student engagement with STLR via STLR-tagged assignments in their classes could be tracked.

To minimize extra work for faculty, the Project Team developed the means to engage students in curricular critical self-reflection by associating one or more of the STLR tenets to an existing assignment (or assignments). This eliminated the need for faculty to add something new to their courses. Rather, they were trained in how to write good reflective prompts that associated one or more tenets to existing class activity.

To briefly clarify here, students engage in the TEF's Disorienting Dilemmas ↔ Critical Reflection ↔ Acting-Engagement loop in their classes when, as described above, an instructor "STLR-tags" an assignment. This means the instructor associates a critical reflective prompt to an existing assignment in the class because that prompt connects to the assignment and also provides students the opportunity to develop their self-reflective abilities. This may or may not result in what Mezirow (2000) would call a transformation in that particular engagement, but UCO's institution-wide operationalization of TL was always designed as an iterative and growth-oriented approach: students could develop across their time at the university, constantly building more expansive perspectives of their relationships with self, others, community, and environment.

UCO devised a 3-level rubric for each of the five STLR tenets. Based on the Association of American Colleges and Universities Valid Assessment of Learning in Undergraduate Education (VALUE) rubrics (2009), but then customized into broadly applicable rubrics for each tenet, rubrics development was an iterative process led across a 9-month period by the university's Director of Assessment. The rubric levels were Exposure (students only demonstrate having been exposed to the tenet's concept[s] without corresponding internalization prompting critical self-evaluation), Integration (students' reflections demonstrate they are beginning to consider what implications exist for potential changes in their lives), and Transformation (students can express how their critical self-reflection has resulted in changes to what they think, do, and/or value).

Building STLR's assessment to be evidence-based naturally brought key aspects of the TEF to the forefront because UCO had to develop an efficacious means of knowing when students' worldviews were shifting, for instance, or what evolution, if any, was occurring in their ways of knowing. The reflective narratives were where this evidence would exist, but the rubrics and faculty training had to ensure such student growth could be identified. In this regard, UCO had the advantage of identifying how the components of the TEF were playing out in students' own words. Illustrative of TEF components are student and faculty expressions drawn from UCO's mixed-methods STLR research over the years (B. Wimmer, STLR Assistant Director for Assessment, personal communication, October 22, 2023).

This brief description of STLR is meant to convey the level of care taken to ensure a process that stays close to Transformative Learning as a theory, concept, and practice. The discussion is also meant to illustrate the TEF's Disorienting Dilemmas ↔ Critical Reflection ↔ Acting-Engagement loop as a key approach around which one university built its operationalization of TL at the institutional level. Then, implementing the system and evaluating the evidence of its effectiveness verified the entire TEF in that many aspects of the framework are recognizable in student and faculty reflective narratives and in student growth over time as assessed using the institution's 3-level rubric.

Many more details could be recounted, such as the creation of, and collaboration with, the STLR Employer Advisory Board, comprised of HR personnel and hiring managers from most of the major workforce sectors in the Oklahoma City metropolitan region. Also not covered here is a detailed

explanation of the STLR Snapshot, which documents students' development within the STLR tenets. The authors direct readers' attention to Brunstein & King (2018), King (2018), King & Wimmer (2020), and King (2021) for more in-depth discussions.

Conclusion

The combination of a research-based framework within which Transformative Learning as instructional practice can be envisioned and developed and a case example illustrating how one university's design and implementation of TL fits within the Transformative Education Framework is meant to provide both theoretical and praxis-based substantiation that Transformative Learning can be an effective approach to instructional practice.

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Redefining High School Education: The Journey of The Lynnhaven School in Embracing Progressive Education in the Modern Era

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Abstract

This article revisits the integration of Progressive Education Theory in the 21st century, highlighting The Lynnhaven School, Richmond, Virginia, a private high school based on Progressive Education Theory. Established in 2012 in response to the restrictive nature of traditional education, Lynnhaven has curricula based on six competencies: knowledge, understanding, discernment, innovation, community, and well-being. Drawing from John Dewey's progressive educational philosophies, The Lynnhaven School merges a decolonized curriculum to nurture competent, civic-minded, emotionally resilient, life-ready students in the modern era of education. This academic model embraces mental health, preparing students for life after high school.

Keywords: Progressive Education, Decolonized Curriculum, Experiential Learning

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Introduction

Progressive education may be the most enduring educational reform movement in the United States of America, with a life span of about one hundred years (Semel & Sadovnik, 1999). John Dewey, often referred to as the father of the progressive education movement, was at the forefront. His seminal work, Democracy and Education, underscores the belief that education should extend beyond mere knowledge acquisition to foster individual development and prepare students for effective participation in a democratic society (Dewey, 1916). Dewey championed the idea of learning through doing, advocating for an educational system that mirrors the complexities of life and prepares students for the realities they will face outside the classroom walls. In today's contemporary educational landscape, a significant shift in the ideals of progressive education has centered on the drive for an academic curriculum and high stakes in the name of enhancing US competitiveness in a global marketplace (Ryan, 1995). The debate about having school standards, curricula, and which methods are the best for teaching and learning are traced back to the origins of the American school system.

Lynnhaven School, established in 2010, is an independent day school for grades 9-12 in Richmond, Virginia, rooted in Progressive Education. The school represents a bold response to the constraints of traditional public and private schooling systems. At its core, The Lynnhaven School seeks to provide a nurturing environment that promotes holistic development—intellectually, emotionally, and socially—for each student in the modern era. The school's approach to education intentionally aligns with the ideals proposed by John Dewey and others, who envisioned education as a fundamental instrument for social progress and individual growth (Dewey, 1916). This article highlights Lynnhaven's mission to harness a transformative approach to education that challenges the status quo of schooling. By integrating

Progressive education theory into its operational DNA, Lynnhaven attempts to address its students' immediate needs and contributes to the broader discourse on educational reform, much like its Progressive education predecessors.

Theoretical Framework of Progressive Education

In the first half of the 20th century, progressive educator and philosopher John Dewey was associated with the Industrial Education movement (Ravitch, 2000). At the heart of John Dewey's philosophy of education is the conviction that education should be an active and engaging process where learning is linked to real-life experiences and societal participation (Dewey, 1938). This principle challenged the industrial education system of the time, which Dewey critiqued for its passive absorption of disconnected facts. Dewey's emphasis on the importance of reflective thought and the application of knowledge to solve real-world problems is evident in his assertion that education is not preparation for life; education is life itself (Dewey, 1899). This assertion underscores education's transformative potential as a continuous growth and development process.

Dewey examined education systems throughout his career, distinguishing traditional and progressive educational philosophies. In his book, The School and Society, Dewey (1899) laid out the theoretical framework for progressive education and emphasized the importance of experiential learning. Dewey (1938) argues that neither traditional nor newly emerging progressive forms of education were adequate in their pure forms, advocating for a balanced approach that takes the best of both. Dewey critiques traditional education's rigid adherence to rote memorization and passive absorption of predetermined knowledge. He believed this approach to education was often disconnected from students' interests and experiences, which needed to be considered through the learning process. He saw this approach as overly authoritarian and stifling to students' intellectual and social development (Dewey, 1938). According to Dewey, traditional methods fail to recognize the learner's active role in constructing knowledge and do not encourage critical thinking or problem-solving skills.

Integration of the Progressive Education Framework in the Modern Era

The practical application of Progressive education at The Lynnhaven School represents a dynamic synthesis of Dewey's visionary principles with modern pedagogical approaches and innovations. Though the emergence of progressive education in the modern era represents a significant advancement, the commitment to a decolonized and inclusive curriculum introduces a paradox, highlighting a departure from early 20th-century practices where the curriculum was deeply colonized. The approach to inclusive curriculum is the most significant deviation from Progressive education.

The landscape of modern education is complex. The quest to reconcile theory with practice remains at the forefront of pedagogical innovation. It has been the great paradox in the American education system since its inception over 300 years ago with the opening of the Boston Latin School. At the heart of this exploration lies the philosophies of Dewey and others whose theories on Progressive Education have catalyzed a reevaluation of conventional teaching methodologies. Dewey's Laboratory School: Lessons for Today is a pivotal case study in applying Dewey's educational philosophies in the modern era (Tanner, 1997).

Experiential Learning

Experiential learning, conceptualized by David Kolb, emphasizes the critical role of experience in the learning process. Kolb’s (1984) model, rooted in the works of John Dewey, Kurt Lewin, and Jean Piaget, posits that learning is a cyclic process involving four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation. This theory underscores that effective learning occurs when individuals can engage in a cycle of experiencing, reflecting, thinking, and acting. Dewey (1938) argued that education should be grounded in real-life experiences and that reflective thinking is essential for meaningful learning. Dewey’s philosophy, which advocates for learning through active participation and reflection, significantly informs Kolb’s experiential learning theory, bridging theoretical concepts with practical application. Experiential learning is a dynamic and integrative

educational approach that places students at the center of real-world, complex problems, necessitating their engagement in research, problem-solving, and project execution over extended periods. This method, a core component of progressive education frameworks, heavily draws on Dewey's principles of experiential learning. Dewey articulated that learning is most impactful when it is an active and socially interactive process, suggesting that knowledge emerges from the interaction between learners and their environment (1938). The Lynnhaven School actualizes the experiential learning approach by immersing students in deep investigations that require synthesizing knowledge across various disciplines, thus promoting a holistic learning experience.

Example of Experiential Learning at The Lynnhaven School

The integration of experiential learning within the Environmental Science curriculum at The Lynnhaven School exemplifies a progressive educational model that is both immersive and hands-on. Central to this innovative pedagogical approach is experiential learning investigating a historically and environmentally significant event: Virginia Governor Mills Godwin Jr.'s closure of the James River to fishing in December 1975. This inquiry captivates students' interests and serves as a multidimensional platform for exploring interconnected themes such as policy analysis, environmental justice, historical context, and the development of communication skills.

To augment their theoretical understanding and directly engage with the subject matter, students are immersed in experiential learning, such as visits to the James River, where they can observe and analyze the ecological impact and recovery firsthand. These experiential learning opportunities are further complemented by collaborations with organizations like the Chesapeake Bay Foundation, which enable students to contextualize their projects within broader environmental conservation and advocacy efforts. These partnerships extend the learning environment beyond the traditional classroom boundaries and introduce students to the complexities and challenges of real-world environmental stewardship.

The students also engage with policymakers and politicians at the General Assembly, offering them insights into the legislative and policy-making realms that shape environmental regulations. These interactions provide a practical understanding of the intricacies of ecological governance, policy formulation, and the pivotal role of civic engagement in influencing public health and environmental protection measures.

The holistic approach to experiential learning at The Lynnhaven School embodies the principles of progressive education by fostering a comprehensive and integrative educational experience. Students are not merely passive recipients of knowledge; they become actively involved in a learning journey that spans multiple disciplines and real-world applications. Students develop critical life skills through this learning process, including problem-solving, critical thinking, teamwork, and effective communication. They cultivate a sense of civic responsibility and environmental ethics, equipping them to address and navigate the challenges at the intersection of environmental science, policy, and community engagement.

Steps to Implementation of Experiential Learning

1. Lesson Introduction: The lesson begins by introducing the students to the closure of the James River to fishing in December 1975. This topic is a gateway to exploring various themes such as policy analysis, environmental justice, historical context, and communication.
2. Research: Students will engage in online research about the James River and devise questions, comments, and opinions organically, propelling conversations and dialogues as they progress through the lesson.
3. Field Experiences: Students participate in field trips to the James River to enhance their understanding. These visits provide firsthand observation opportunities, enabling students to study the ecological impact and recovery efforts directly.
4. Collaborative Partnerships: The curriculum incorporates collaborations with external organizations like the Chesapeake Bay Foundation. These partnerships offer students broader perspectives on environmental conservation, linking classroom learning to real-world advocacy and stewardship efforts.

5. Engagement with Policymakers: Students can interact with policymakers and legislators at the General Assembly and local government officials. These engagements offer insights into the processes that shape environmental regulations and underscore the importance of civic participation in public health and environmental protection initiatives.
6. Skill Development: Throughout the unit of study, students work on developing a range of essential skills, including problem-solving, critical thinking, teamwork, and effective communication. These competencies are vital for their growth as informed and responsible citizens.
7. Civic Responsibility and Environmental Ethics: The lesson aims to instill students' sense of civic duty and environmental ethics. They are prepared to face and address the complex challenges at the intersection of environmental science, policy, and community engagement. They are ready to make positive contributions to society and the environment.

This step-by-step implementation of experiential learning demonstrates an example of a progressive education model that prepares students for the complexities of the modern world. It aligns with and advances Dewey's educational philosophies for future learning environments.

Decolonized and Inclusive Curriculum: Absent During the Progressive Era

While John Dewey is celebrated for his foundational contributions to progressive education, emphasizing experiential learning, democracy in education, and social interaction, it is vital to acknowledge the limitations in his discourse, particularly concerning race and racism. Dewey's extensive body of work, pivotal in shaping educational theory and practice, often falls short of explicitly addressing the intricacies of race and the systemic nature of racism within the educational system and society at large. Educational scholars have critiqued Dewey for this oversight, pointing out that despite his progressive stance on many issues, there needs to be a thorough engagement with race matters. While revolutionary in advocating for a child-centered approach and developing critical thinking skills, Dewey's philosophy does not directly confront the challenges posed by racial inequality (Ryan, 1995). This gap is significant, considering the impact that race and racism have on educational equity and social justice. Dewey's theoretical framework largely overlooks the racial prejudices and discrimination that pervade American society. This omission is notable given the era in which Dewey wrote when racial segregation and discrimination were legally and socially enforced in the United States (Kloppenberg, 1986). To address these criticisms, contemporary educators and scholars advocate for integrating Dewey's progressive educational principles with a more explicit focus on racial justice and anti-racism. The Lynnhaven School embraces these principles and intentionally incorporates modern and contemporary approaches to decolonizing the curriculum. This involves critically examining and revising curricular content, teaching practices, and educational policies to confront racial biases and inequalities head-on, ensuring that progressive education promotes inclusivity and equity for all students (Ladson-Billings, 1995).

Balancing Act: Modernized School Week

The weekly structure at The Lynnhaven School offers a reduced schedule of core academic days complemented by a day dedicated to electives, internships, or early release, which mirrors the progressive education principles advocated by John Dewey. Dewey (1938) believed education should be a social process focused on the individual's well-being, fostering a balance between acquiring knowledge and developing personal interests. The modern approach to an academic workweek anchors the school's interpretation of this philosophical belief. By allocating Fridays for experiential learning and personal growth opportunities, The Lynnhaven School reduces academic hours, in line with research supporting the link between fewer structured academic hours and improved student well-being, and actively applies Dewey's educational philosophy (Basch, 2011). Dewey (1902) asserted that education must extend beyond the transmission of facts to include experiences contributing to students' physical, emotional, and social growth. This approach recognizes that the well-being of students is as crucial as their academic development and that real-world experiences are invaluable to the learning process.

The Lynnhaven School's schedule encapsulates Dewey's view that education should be tailored to the development of each student, accommodating their individual needs and interests. The flexibility inherent in this schedule allows students to engage in diverse learning activities that foster autonomy and responsibility, aligning with Dewey's (1916) vision of education as preparation for democratic participation in society. The modern schedule is a strategic educational choice and reflects a more profound philosophical commitment to developing engaged, well-rounded individuals. It stands as a modern embodiment of Dewey's progressive ideals, emphasizing the importance of creating educational experiences that are meaningful, engaging, and conducive to students' overall development as they prepare to navigate the complexities of the world.

Concluding Remarks

The Lynnhaven School's journey of adopting Progressive Education Theory in the modern era affirms Dewey's vision, interwoven with the complexities of present-day educational demands. The school is committed to fostering an education reflective of real-life experiences and societal changes.

Dewey's contributions to Progressive Education laid the groundwork for such an approach, the practicalities of educational reform often reveal a gap between theory and application. The Lynnhaven School's efforts to decolonize its curriculum and adopt an inclusive pedagogy address this gap, moving beyond Dewey's original scope to confront issues of race and equity that were not fully articulated or addressed in his era. This evolution within Progressive Education reflects the school's understanding that the ethos of inclusivity and responsiveness to societal shifts is not static but requires constant reevaluation and adaptation.

The Lynnhaven School remains dedicated to nurturing students to become informed, engaged, and responsible citizens capable of contributing positively to a diverse and dynamic society. In doing so, it honors the spirit of Progressive Education while plotting new paths that align practice more closely with theory.

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Building transformative search engines: Understanding differences in the reflectivity of essays produced using ThoughtShuffler and Google

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Abstract

Studies suggest college students/adult learners interacting with current search tools like Google display tendency to power-browse and adhere to page-ranking order in choosing sources to supplement writing. Such limitations may limit critical reflectivity. We present a tool, ThoughtShuffler which allows users to malleably alter neighborhoods of keywords and presents results as arrays of cards and collections that can be compared and contrasted. We conducted binary qualitative coding of essays produced by 39 users divided into experimental and control conditions and computed a one-tailed t-test to understand if using ThoughtShuffler produced greater likelihood for higher-order reflectivity expressed in writing about efficacy of varied healthcare models in the U.S., compared to the use of Google to write about the same prompt. Our results suggest that updating search engine interfaces to afford capacity for lateral reading may present potential to augment reflective information search.

Keywords: ThoughtShuffler, Higher-Order Reflectivity

Building transformative search engines: Understanding differences in the reflectivity of essays produced using ThoughtShuffler and Google

Introduction

The Internet supports both adaptive and nihilistic user activity. Its use has become pervasive since its inception in the 1990s to find information/services, interact with similar others, and seek new perspectives that change the thinking of users (Glassman, 2016). Searching for information on the internet precedes much exploratory online activity (Lurie & Mustafaraj, 2018). It may allow a person running an

online clothing store on a platform like Grailed to search for good deals to source items from online boutiques (e.g., SSENSE, SVRN) to list in their virtual thrift store. If individuals seek services (Tuomi, 2002) embedded in cultural markets, it becomes convenient when an online search engine like Google can provide results locating commodities.

When it comes to navigating very complex social and scientific topics and developing nuanced views about them, simply inputting questions into a traditional search engine like Google may produce one-dimensional answers. This can create filter bubbles of information that may bias thinking (Parisier, 2011). The reason may lie in Google's algorithm being rooted in page-ranking technology among 200 signals to provide surety to users (Oulasvirta et al., 2009). The PageRank algorithm, developed by Brin & Page (1998) lists results by link popularity, prioritizing the pages most cited on other websites, treating them as highly reliable. However, the question to ask is whether certainty in answering a question on one's mind can produce as nuanced an answer as an emancipatory knowledge creation process (Scardamalia & Bereiter, 2006) leading users to jump from perspective to perspective. Through knowledge creation, users can explore varied ideas and present integrated arguments, allowing transformation of their perspectives regarding topics they deal with.

Weighing varied perspectives to come to an integrated solution to a problem is central to Mezirow's (1991, 2003) transformative learning theory. The theory states sustained work on a problem statement to grapple varied sides of an argument can produce nuanced thinking, and also civil discourse with others. Applying this notion of transformative learning to an individual's use of a well-designed search engine, the goal would be to create a cyclical conversation between user and tool with the user becoming able to evaluate sources by comparing them to others (or lateral reading) rather than adhering to one-dimensional ideologies about topics. Essentially, this entails changes in search engine interfaces to allow users to malleably alter search terms to find specific conceptual relationships in online sources that are relevant to their current epistemologies may spur lateral reading (Wineburg & McGrew, 2017). Any tool, in the context of producing sustained reflection, should be able to intake conceptual relationships relevant to a user (Pask, 1975b) and produce arrays of ideas to compare to facilitate critical reflection.

When computer-mediated reflection is viewed using Pask's cybernetic principles, both user and machine become nodes in a sociotechnical system that can be fine-tuned to produce adaptive reflection, learning, or even information seeking, depending on the tool's purpose, and the task (Scott, 2021). The human brains/bodies/computer hardware are M-individuals, and the ideas imbued within them (this would be Internet results in the search engine, and the conceptual focus of the user's search) are P-individuals. For example, in searching for sources, a participant studying about women's sexual health rights can use a computer loaded with the search engine (both M-individuals) to compare and contrast varied information sources, and attain a nuanced view of the systemic issue in the U.S. related to hot topics like abortion, by considering the implications of pro-life and pro-choice perspectives (the user perspectives and Internet data, both P-individuals, interact, and produce a P-individual). In a post-truth era marked by polarizing debates about controversial issues (Barzilai & Chinn, 2020; Glassman et al., 2023), equipping users with the skills to critically navigate concepts on the Internet, and creating interfaces allowing them greater malleability to do so can sharpen both ends of a sociotechnical system (human efficacy, and designed tools). Sociotechnical human-computer interaction can be pivoted towards solving specific wicked problems (Behymer & Flach, 2016) salient to society or even to smaller goal-oriented groups.Collaborative reasoning and argumentative writing become educational avenues to move human agency in adaptive directions in these systems.

In this qualitative study, we present a new search engine, ThoughtShuffler, that revisualizes Google's results as horizontal rows of cards, using a calculation that determines combinations of user keywords that enhance curiosity and knowledge about a topic (Pangaro, 2008).We hypothesize this interface will spur critical reflection to a greater degree than Google owing to greater opportunities for lateral reading and source comparison. We use writing produced by humans as a proxy for conceptual operators and understand difference in the and magnitude of these conceptual operators for participants using ThoughtShuffler and Google. We use Mezirow's (2003) transformative learning theory to specify psychological processes (namely, critical reflection) we investigate within our cybernetic framework of

M-individuals (humans, computers loaded with interfaces) and P-individuals (Internet data, intentions for search, ideas produced in writing).

Theoretical Framework

Information Search and reflection

Research shows that during internet exploration, individuals evaluate the credibility of information by relying on sources presented by tools like search engines and comparing them with their own prior knowledge (McGrew et al., 2018). Commonly deployed search engines like Google rely on ranked algorithms that sort pages by link popularity (Pangaro, 2008). Google allows us to pick an argument and search for ideas matching it. But it produces results relying on popularity metrics, and even blurbs or knowledge panels, providing answers to specific questions that may bias users to think in one direction or another (Jeanneney, 2008). Pariser (2011) provides the example of an oil tycoon and environmentalist using Google to search about oil spills. Both individuals are presented different ideas drawn from past search histories and digital footprints. The oil tycoon may reinforce their own thoughts about economic development, while the environmentalist may become disillusioned by the fallouts of industrialization or be spurred to create grassroots and practice-oriented efforts to raise awareness about detriments of crude oil as a primary energy source.

The filter bubble concern is magnified when considering young adults and college students who turn to the Internet often struggle to critically evaluate online sources through lateral reading (McGrew et al., 2018; Wineburg & McGrew, 2017). The reason students struggle with understanding source credibility and making nuanced arguments by using opposing sources is because of the rapid expansion of online information. This being said, how users interact with information and how search interfaces organize information can also inform reflective processes. Internet-mediated learning is not solely about being guided to specific information aligning with our perspectives. Transformative learning through interaction with online interfaces can be facilitated by critically evaluating ideas to understand the ramifications of the ideologies one possesses as an active citizen in a digitized society.

Jeanneney (2008) suggests page-rank search engines like Google produce results based on popularity and rank rather than scholarly and topical worth and do not provide a sandbox that can be utilized for in-depth analysis of problem statement. Eye-tracking studies of user interaction with Search Engine Results Pages (SERP) produced by Google showed users focus their attention to the top left and hover in an area around the first few results (Hotchkiss & Alston, 2005). This is called the Golden Triangle. With the rapid expansion of video, images and other heterogeneous formats, and incorporation of Knowledge Graphs (relationalities between concepts) into Google's results, this Golden Triangle is still used to explore the first few results, but is supplemented by vertical scrolling emblematic of interaction observed on popular social media (Maynes & Everdell, 2014). These two processes lend to the tendency for adult users to rely on the most immediate results produced on the SERP (Gwizdka & Bilal, 2017) without deeply considering source and argument.

Sticking to one's ideologies and strengthening them through results ranked by link popularity may make users interacting with each other even in distributed ecologies less willing to understand the how and why of their ideologies and how alternate perspectives may have worth. It is no surprise that high schoolers and even college students interacting with search engines find it difficult to engage in critical analysis (Skinnell, 2021). Educational offerings, specifically classes in argumentative writing fostering 21st century skills such as search engine use and source navigation may help learners attain skills for critical thinking in an information saturated society. We suggest Mezirow's (2003) transformative learning theory, which focuses on individual and collaborative reflection, may help lay out processes users undergo during information search. We treat human-computer interaction as a conversation, situating our specific investigation of transformative reflectivity in information search within Pask's conversation theory (Tilak, 2022). We describe how using a search engine can be considered as a reflective act using the nomenclature of M- and P- individual.

Transformative Learning, Conversation Theory, and Information Search

While studies show adult users interacting with search engines perceive that critically evaluating the credibility and argument made by information sources is important, they display limited competence to critically evaluate sources (Petrucco & Ferranti, 2017) and falsify (Popper, 1963) stances they take to make their arguments more powerful. Mezirow (1991) suggests criticality in interacting with knowledge can help morph perspectives about a particular problem and understand it in a more nuanced manner; what he called transformative learning. While there have been psychocritical and psychonalytic interpretations of the theory focusing on individual reflection, these have been expanded to consider socio-emotional and collaborative learning (Mälkki, 2010). We tap into these aspects but treat users and technologies as interacting systems within a problem-solving space; what Behymer & Flach (2016) call a sociotechnical system. We implement Mezirow's theory within a cybernetic framework relying on Pask's (1975b) conversation theory. Humans and computer systems/interfaces are M-individuals linked by conversational feedback loops, embodying concepts (Internet data, and prior knowledge) that produce new concepts or P-individuals that define ideas being investigated, and processes engaged to create nuanced arguments related to these ideas.

We contextualize a critically oriented information process search culminating in writing an essay, by situating Mezirow's 11-step theory (1991) within Pask's M- and P-individual nomenclature (see Figure 1). The user (M_1) embodies a dynamic P-individual (P1), starting out with a dilemma, and may examine their own views about a particular topic before interacting with the computer interface's (M_2) data (another P-individual, P2) to search for ideas. They then input ideas and statements they would like to focus their search on and critically assess their ideologies by recognizing, exploring, and comparing competing sources. They may jot down initial ideas as points or a rough essay to plan further writing. Following this, they may search for additional sources to further acquire knowledge related to the topic being investigated, supplementing their initial brief exploration. This initial jotting may help users provisionally understand what their interpretation of a particular topic roughly is, building their own confidence in the stance they take. After having a basic structure for their essay, the user reintegrates ideas, and forges a new relationship with the tool by being able to critically evaluate their own views, transforming their thinking. The writing of the user (P3) becomes a proxy for the P-individual produced by human-computer interaction.

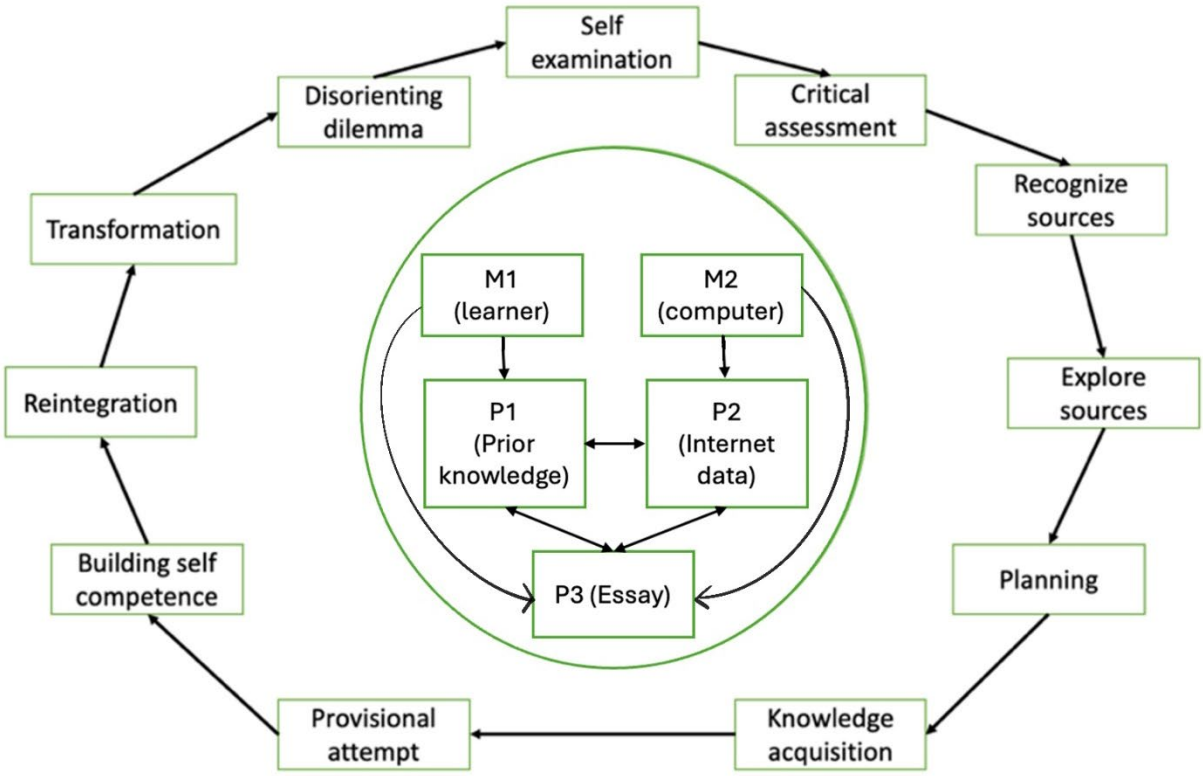

Figure 1: Critically reflective information search

While this interaction with a search tool presents hope for the creation of nuanced arguments and ideologies, our review of studies has shown that critically reflective human-computer interaction is a challenge with commonly deployed search engines like Google. In this study, we test user interaction with a new search engine known as ThoughtShuffler, to understand whether using it for tasks like argumentative writing can alleviate concerns with the lack of capacity for critical reflection in the use of traditional search engines.

ThoughtShuffler: Updating search-engine interface design

ThoughtShuffler is an interface design that may extend capabilities of present search engines like Google. While current tools primarily rely on a ranked popularity approach and implicitly incorporate Knowledge Graphs into search result production, we suggest making relational processes of search less abstract to users may enable greater autonomy in comparing/contrasting varied sources. ThoughtShuffler, designed by Paul Pangaro, a student of Pask, can spur an exploratory, reflective approach to information search. Rather than examining relationalities within inputted questions and sentences and producing answers/blurbs and results ranked by link popularity and keyword frequency among other criteria (as Google does), ThoughtShuffler accepts keywords as input and produces horizontal arrays of cards that contain keywords fed by the user and those suggested by the tool through an analysis of source content. In this section, we provide an overview of ThoughtShuffler's functionalities and visually showcase the tool.

The landing page for ThoughtShuffler is minimalistic and comprises a search bar (Figure 2) where keywords one desires to investigate related to a particular topic can be inputted. We input keywords related to a prompt related to universal, privatized and mixed healthcare models in the U.S. context, that our participants answered, to showcase ThoughtShuffler's functionalities. The prompt asked: S*hould universal healthcare be seriously considered in the U.S. as it has been in other countries or is it worthwhile to continue promoting private healthcare? Why?* This topic seemed relevant to adult learners/college students approaching and beyond the age of 26 years since insurance and healthcare coverage are topics of contention owing to high costs of medical assistance in the U.S.

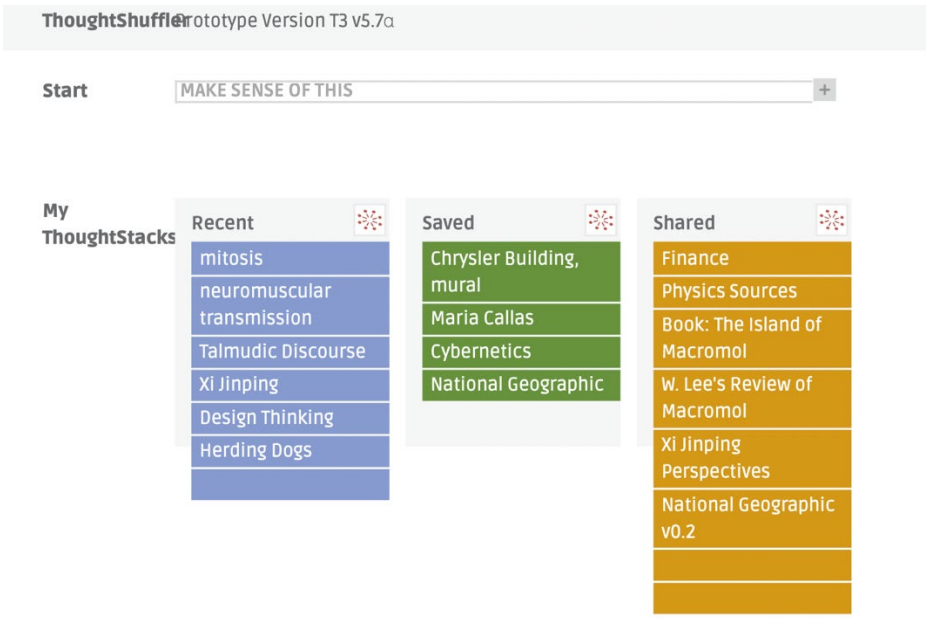

Figure 2: Landing page for ThoughtShuffler

If one is trying to search about efficacy of universal and privatized healthcare models using ThoughtShuffler, they can start with any number of base keywords separated by commas like "healthcare". This brings up the search interface (Figure 3) to input more keywords. Clicking the tool tips option at the top will provide specific directions for every time one hovers over a particular part of the interface. In our example, we inputted keywords like "universal", "cost", and "United States" to find more specific sources to better contextualize the essay writing task described in the methods section.

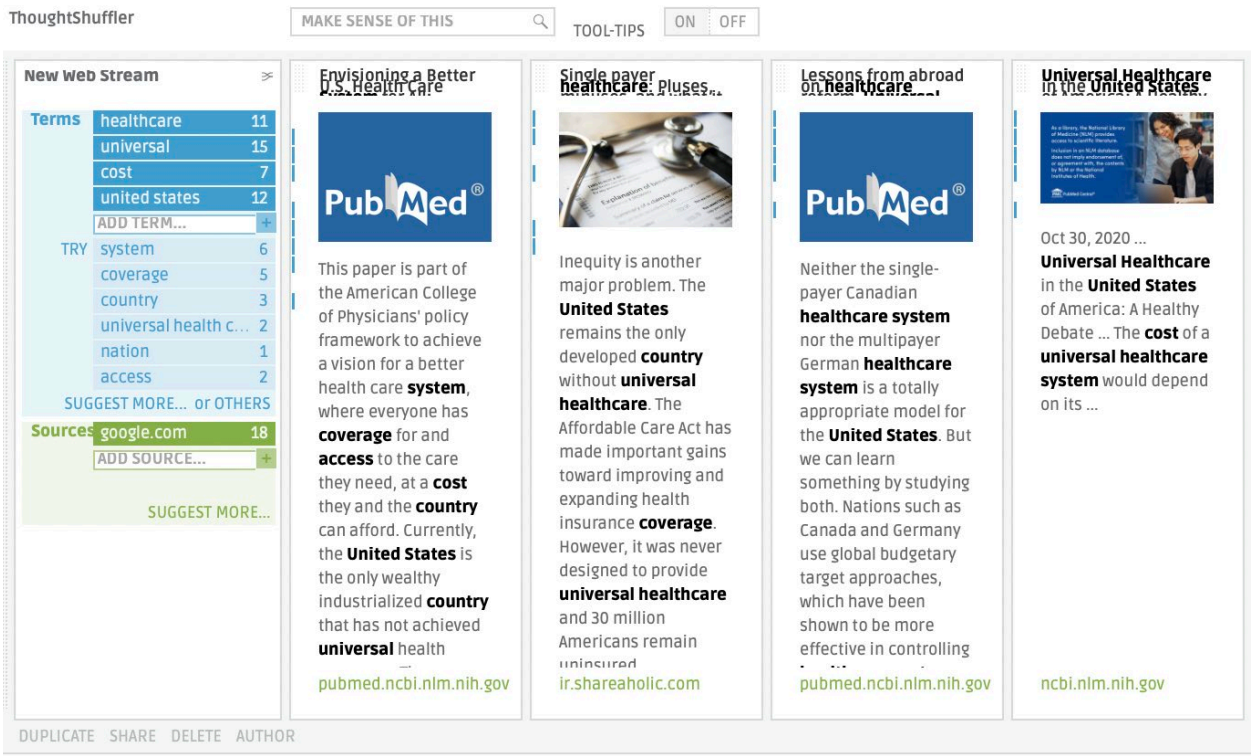

Figure 3: Array of cards produced in the search interface

The interface produced by inputting keywords into the engine comprises horizontal rows of cards to be clicked on (Figure 4). The tool suggests additional keywords by analyzing sources to find associated themes. Google's results are re-ranked based on the uncertainty presented by co-occurring user-fed and suggested keywords each source to users. The richest sources appear first, increasing both knowledge and curiosity about the search topic and regulating uncertainty. Each card can be expanded to reveal a notch displaying keywords it contains, displayed on the left-hand side of each card. The expanded card shows parsed text containing these specific keywords, allowing a user to understand immediately if it is relevant to their search. The user can modulate the number of keywords at will and doing so produces a different array.

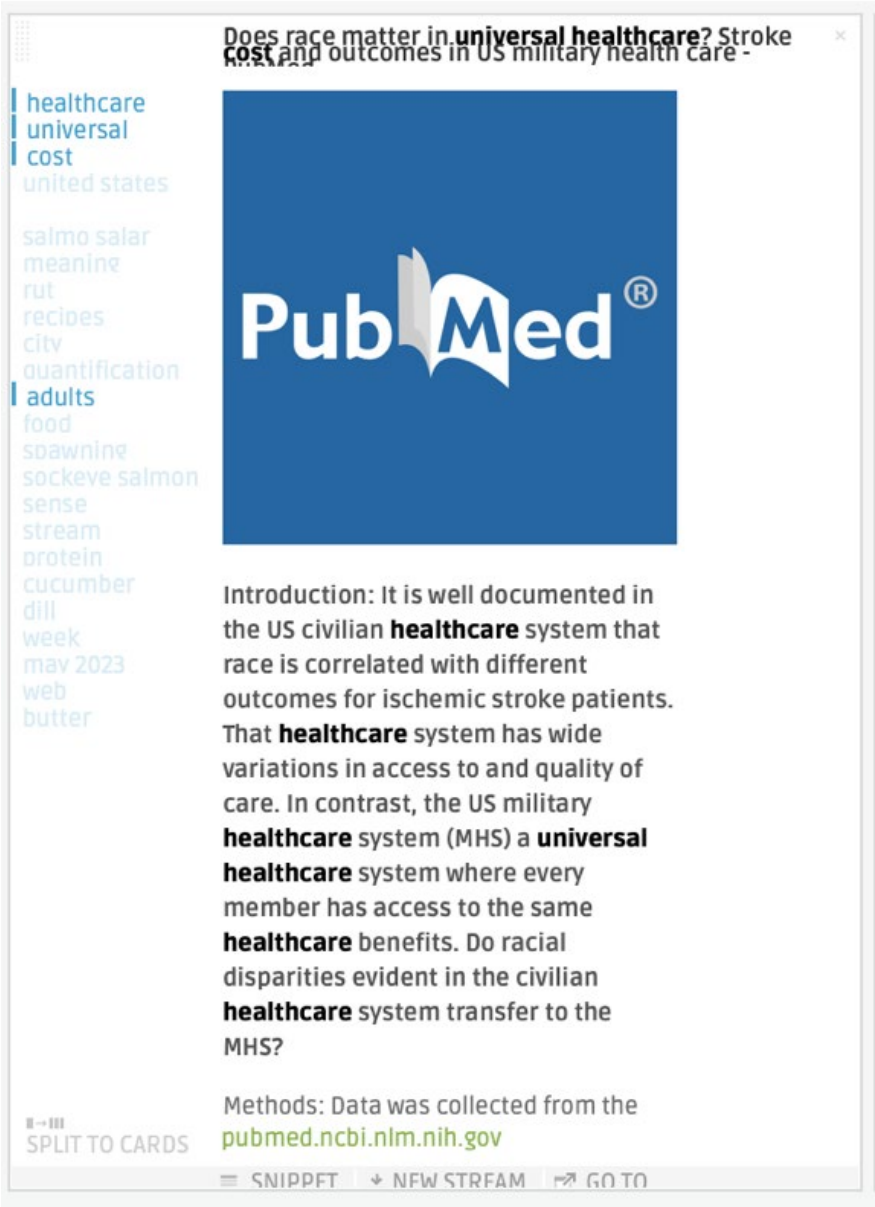

Figure 4: Expanded card displaying user inputted keywords

In addition to comparing ideas within one collection of keywords, the user may press the "Start New Collection" button in the center of the interface to initiate a search for a new neighborhood of keywords. In our example, we started a search about privatized healthcare in the U.S. context.

Figure 5 showcases the multiple collections that may enable users to compare and contrast universal and privatized healthcare models with greater ease. The tool allows users to engage in source comparison at two levels of specificity, within a collection of concepts, and between varied collections with nuanced differences and commonalities. Each source can be opened in a new window allowing the user to view the interface and the expanded source simultaneously. Those writing essays needing extensive source comparison may experience increased convenience in doing so.

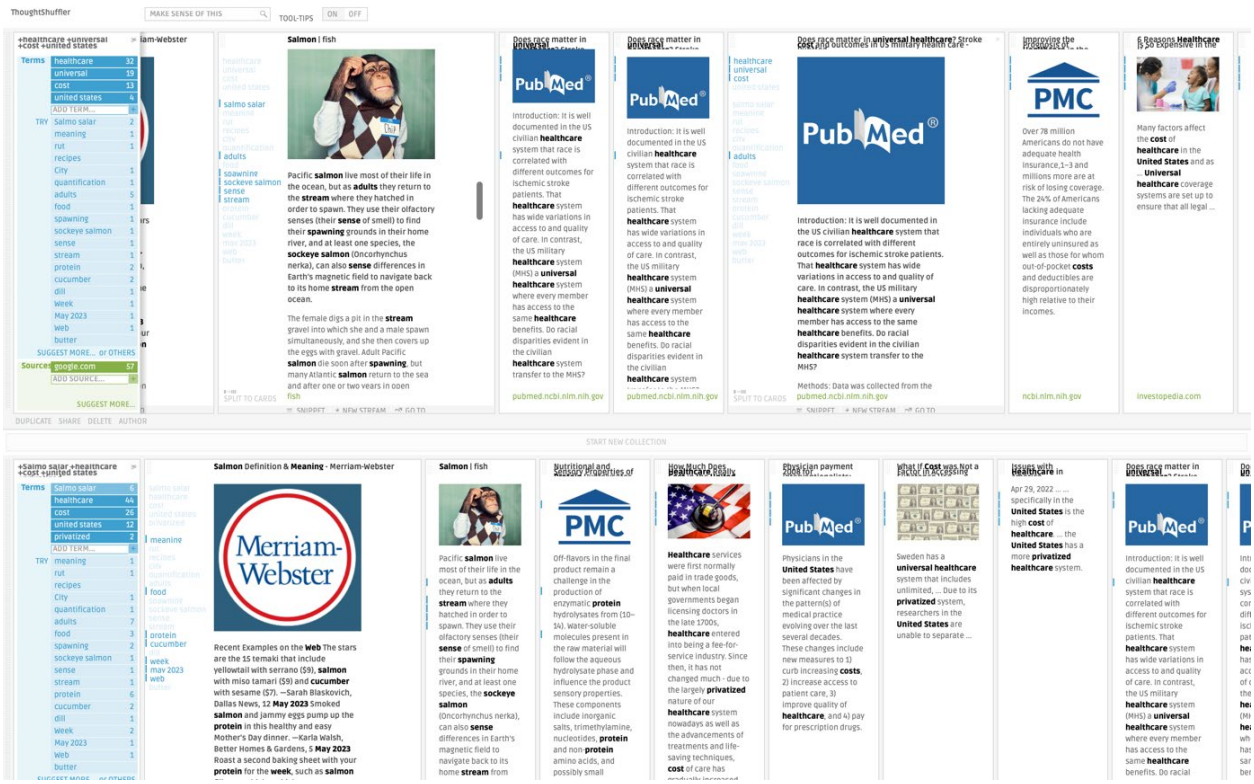

Figure 5: Varied collections to be compared and contrasted through lateral reading

Since ThoughtShuffler is in development, some features like multiple keyword input and creating new collections may exhibit bugs that our team is working on correcting through user experience studies that will inform the redesign process.

Present Study

We adopt a qualitative design and aim to understand differences in the magnitude of adult participants displaying different kinds of argumentative structure or reflectivity in writing produced using ThoughtShuffler and Google. Our aim is to understand if ThoughtShuffler can present users with higher likelihood for critical reflection that emerges from lateral source comparison; making it a potentially useful tool in college argumentative writing classes. We conduct coding of essays produced using both tools, and compute one-tailed t-tests to understand if there was significant difference in the proportion of users exhibiting higher-order reflectivity in our experimental and control groups. We hypothesize:
H1: *A greater number of adult learners/professionals using ThoughtShuffler will exhibit higher-order reflection in writing, compared to those using Google.*

Method

Data

Data were drawn from an experiment wherein adult participants were randomly assigned to a treatment or control group to write essays either using ThoughtShuffler or Google. Following the essay writing, the participants each gave a cognitive interview led by a member of the research team to answer questions about their information search process and describe it in greater detail. In this study, we test differences in the argumentative structure of essays in both groups, using a coding scheme our team previously developed (Tilak et al., 2020) to study the reflectivity of writing produced in college classes, based on Mezirow's transformative learning theory.

Participants

Thirty-nine adults (51.2% female, 48.8% male) participated, residing in the United Arab Emirates, the United States, and the Caribbean. The team used convenience sampling and recruited participants from classes in education and psychology at the university, and from their immediate network. Each participant received a $20 Starbucks gift Card. The study was approved by the university's Institutional Review Board. Local participants were invited to a well-lit room on the university campus to perform the task, while those situated in other states and countries were asked to participate via Zoom and share their screen with the observer to record their search process. Participants in the experimental condition were shown a short video tutorial about ThoughtShuffler before commencing essay writing and the following interview; those in the control group immediately began writing.

Coding Scheme

We employed a coding scheme that has been previously used to understand the type of reflectivity displayed in college students' writing (Tilak et al., 2020). The authors relied on Mezirow's theory of transformative learning and Habermas' ideas on instrumental and communicative rationality to create the coding scheme. Instrumental forms of reflection were rooted in considering just one side of an argument that a person adheres to in their own mind, while transformative reflectivity (akin to a more communicative rationality) involves reaching outwards to accrue new ideas and compare them to one's own. The four variables in the coding scheme are:

1. **Instrumental understanding:** involves collection of information or facts and its reproduction, rather than incorporating one's own standpoint, or critical analysis into writing.
2. **Instrumental critical reflection:** Involves making a one-sided argument and harshly critiquing a particular perspective, rather than presenting a balanced solution and critical analysis.
3. **Transformative understanding:** Involves weighing out varied sides of an argument without presenting a concrete solution or action plan.
4. **Transformative critical reflection:** Weighing out varied sides of an argument or problem statement and presenting a concrete solution or action plan based on this critical analysis.

The coding scheme treats each piece of writing (a blog, an essay) as a unit of analysis, and assigns binary contingency (0 for absence, 1 for presence) for each variable. Categories are mutually exclusive. In the next section, we provide examples of essays in our dataset that display each of the four types of reflectivity.

Coded Examples

We selected a handful of coded essays displaying reflectivity corresponding to each of the four coding categories. For each essay, the indication of the presence of a particular variable led them to be coded with a 1; all other three variables would be marked as 0 for their absence in a written essay.

Example 1: Instrumental Understanding

This essay was coded as exhibiting instrumental understanding because it states varied factual information and statistics about the mixed healthcare model in the U.S. without much incorporation of the participant's standpoint. Moreover, it does not come up with a balanced solution; rather suggesting a shift towards universal healthcare based on existing facts.

> *Healthcare is a contentious topic across the globe and many countries have their own policies. The two main stances on health care are public or universal healthcare coverage versus private healthcare. The topic is particularly salient in the United States and has been incorporated into political debates, especially during election periods. Controversy surrounding Obamacare or the Affordable Care Act is one example of the debate in the USA; criticisms often regard disrupting the current system, increased tax amounts, and political beliefs (i.e. during the 2016 election cycle universal healthcare was increasingly associated with candidate Bernie Sanders and socialism).*

Despite or even because of the debates surrounding universal healthcare in the USA, it should be seriously considered as it has been in other countries.

A primary reason that universal healthcare should be considered is the high costs associated with private healthcare for individual citizens. Although most people in the USA are insured, this insurance is often tied to employment (individual or a family member's) and it is very expensive. If someone is not able to be insured by these means, they may have access to Medicaid or Medicare, depending on a set of criteria like income level and state of residence. Further, health insurances are divided into health, dental, and vision. This means that someone who has health insurance in the USA may not have dental or vision insurance, but these things are considered part of one's overall health (because these insurance programs are separate, they also come at extra cost).

The high costs associated with private insurance plans may lead some to "take a chance" on being uninsured. The average monthly cost for insurance in the USA is over $500, and insurance does not always cover the costs of all medical procedures or visits which also have co-pays that can be as low as $15 or $300 to go to the emergency room. The healthcare system is difficult to navigate as individuals often must work with their employers, insurance companies, and hospitals or doctors' offices to make sure that procedures are covered. These are just some of the reasons that 41% of adults in the USA have some kind of healthcare debt, often between $1000 and $2500. If one is unable to cover the high monthly and annual costs associated with private health plans, they gamble with their health and savings accounts as costs for uninsured individuals are even higher. For example, emergency room visits can be an average of $1000-3000. Further, depending on where you live and the contracts your private insurance company has (if you are insured), this does not include an ambulance ride which can be an additional $1000.

This situation is simply not the same in other countries. While Canada and the UK have been criticized for long wait times and insufficient care, the burden of healthcare costs and concerns does not lie as heavily on the individual as it does in the USA for countries that have universal healthcare programs. Countries like South Korea, Taiwan, Denmark, and Sweden are all ranked at the top of lists for best universal healthcare programs, and each have different mechanisms for implementation. Most of these places still have private plan options through employers or for those with enough financial means to access them, but most individuals are enrolled and utilize the universal system. This means that the USA changing the dominant system would mean a big change, but not require the complete elimination of private insurance options. The USA should begin its serious exploration of universal healthcare as a shift in funding and resources that would relieve healthcare debt and burdens from Americans, especially low-income individuals, elderly residents, and those in precarious employment situations.

Lastly, the World Health Organization has named universal healthcare as a strategic priority. The USA should align itself with global health goals and priorities, especially since the country has regularly been ranked last among industrialized and high-income nations in the matter of healthcare.

Example 2: Instrumental Critical Reflection

The essay outlines detrimental effects of privatized healthcare models affecting individuals with lower socioeconomic status and lack of insurance. It proposes widespread adoption of universal healthcare models in the U.S. rather than weighing pros and cons of both models before coming to their conclusion and suggesting a new solution.

Universal healthcare in the United States should be seriously considered like other countries for several reasons. For the U.S. being the only developed country that has not implemented it, it spends

the most on healthcare costs. Yet there are countless stories of people who don't go to doctors or the emergency room because of the costs, specifically out-of-pocket; people have expressed that they would rather ride in Ubers than call for an ambulance due to the cost. Even with payment plans, the cost can still be too burdensome for those who do not have the income.

Those who are low in socioeconomic status can face a lot of problems with healthcare including decreased accessibility to resources and lower quality of health insurance, even though they need accessible resources and quality insurance the most. This can lead to a higher mortality rate in those who may have conditions like diabetes or hypertension. For example, those who have type II diabetes and are uninsured have a 55% increase in visits to the ER, and individuals who are uninsured with uncontrolled hypertension have greater annual healthcare costs- about $2,000.

Criticism of implementing universal healthcare in the United States include being unfeasible due to significant costs and an inefficient system, where patients may wait weeks or over a year. However, there have been proposals to combat these costs increasing taxes which would make those of higher socioeconomic status pay more in their taxes. Though the cost would be high, it would address the infrastructure changes, insuring and/or treating those who have conditions they were not able to treat, and expansion in the amount of services being provided. Furthermore, although the U.S. may experience an increase in wait time, it may be short-term due to increased visits from the removal of the financial barrier.

With the implementation of universal healthcare, it can reduce the health disparities by socioeconomic status and increase health preventative initiatives. Healthcare that is accessible and affordable allows for early intervention that can make chronic diseases preventable or have individuals be at the lower risk. Furthermore, by doing so, it addresses the chronic health crisis in this country by mitigating the economic costs. This not only helps the people, but helps to lessen economic strain.

Example 3: Transformative Understanding

The participant weighs the pros and cons of universal healthcare. While the essay doesn't discuss privatized models, it makes a balanced argument about universal models. It does not propose a new action plan that could create social change in the U.S. context. Hence, this essay was perceived by the raters as exhibiting transformative understanding.

Firstly, I do believe that universal healthcare should be taken seriously and actually applied in the United States. Based on what I have seen so far by using ThoughtShuffler, I do think that the healthcare system in the U.S. needs to be seriously reevaluated, because there definitely are worrying statistics or phenomena right before my eyes.

After including key words such as "improvement," or "universal healthcare" in my search, I have found from an article published in 2014 claiming that "to date, Congress has resisted enactment of universal healthcare even until this day." In addition, most of the results I have found are all about certain organizations (presumably private ones) working to solidify universal healthcare in the United States. For example, AHIP tries their best to "provide health care coverage , services to hundreds of million of Americans everyday."

In an article titled "More Americans now favor single government program to provide health care coverage", it is found that "a majority of Americans continue to say the federal government has a responsibility to make sure all Americans have healthcare coverage." While these findings do not necessarily demonstrate that "universal healthcare is in any way shape or form better than private healthcare," they do indeed show that there are enough Americans who believe that way.

As we all know, universal healthcare works in favor of those who are not as financially established. While universal healthcare probably puts more burden on the shoulder of the government, as a highly civilized as well as autonomous (which means free and sometimes democratic), the civilians are the absolute number one priority. An article on realkm.com claims what most of us already know: "universal health coverage (UHC) means that all people have access to the full range of quality health services they need, when and where they need." At the end of the day, a government is not some charity that just grants its people whatever they want, but universal health care is what enhances survival in the grand scheme of things.

Example 4: Transformative Critical Reflection

This essay describes ups and downs of universal and privatized healthcare models in the U.S. It looks at victories and challenges experienced in the American context and suggests a solution based on considering social determinants and systemic factors related to the cultural experiences of the larger populace to gauge the best models of healthcare to provide. It was thus labeled as transformative critical reflection.

The United States does not have a uniform health system and has no universal healthcare coverage. The health disadvantage of the U.S. relative to other high-income countries is health disparities in health services.

Although the U.S. is renowned for its leadership in biomedical research and cutting-edge medical technology, its medical system faces significant issues such as preventable medical errors, poor amenable mortality rates, and lack of transparency in treatment. Another problem that Americans are facing is difficulty in finding a good doctor. High costs of care and lack of insurance coverage for low and middle-class families have led to social and economic discrimination in healthcare services. The health care system in the United States is uncoordinated and fragmented and emphasizes intervention rather than prevention and comprehensive health management. Health care costs continue to increase at an unsustainable rate and quality is far from ideal.

The question was asked, "Should universal healthcare be seriously considered in the U.S. as it has been in other countries or is it worthwhile to continue promoting private healthcare?" My response to this question is "Yes! The United States of America should adapt to a universal healthcare system." By adapting to a Universal health coverage (UHC), more people would gain access to the health care they need without suffering financial hardship. UHC allows countries to make the most of their strongest asset: human capital. Supporting health represents a foundational investment in human capital and in economic growth—without good health, children are unable to go to school and adults are unable to go to work. It is one of the global economy's largest sectors and provides 50 million jobs, with the majority held by women.

Over the past two decades, policies implemented through the Children's Health Insurance Program (CHIP) and the Patient Protection and Affordable Care Act (ACA) have extended access to affordable health care coverage to millions of previously uninsured, non-Medicare eligible adults and children. The uninsured population reached a historic low of 8.8% under the implementation of these policies. The greatest gains in coverage have occurred among our most vulnerable populations and young adults. However, the rollback of some provisions of these policies has increased the percentage of those uninsured to 15.5%, close to what it was one decade ago when our uninsured rate was nearing 17%, with nearly 50 million people uninsured.

Ensuring that all people in the United States have affordable health care coverage that provides a defined set of essential health benefits (EHB) is necessary in order to move toward a healthier and

more productive society. Additionally, the health care system must begin to account for and address social determinants that have a profound impact on individual and population health outcomes and costs, such as socioeconomic status, housing and occupational conditions, food security, and the environment. As noted by the Commonwealth Fund, the design of a system to provide health care coverage to all people "will have a deep impact on its ability to make sustainable and systematic improvements in access to care, equity, quality of care, efficiency, and cost control." This is key to achieving the World Bank Group's (WBG) twin goals of ending extreme poverty and increasing equity and shared prosperity, and as such it is the driving force behind all of the WBG's health and nutrition investments.

Data Analysis

The three raters first coded 20% of the dataset and computed a three-way kappa score for each of the four variables in the coding scheme, using binary values and ensured that they indicated substantial to perfect agreement (O'Connor & Joffe, 2020). Upon ascertaining validity of the coding scheme through this agreement exercise, all essays were coded. Skewness and kurtosis values were computed for essays exhibiting each level of reflection. Following this, descriptives were computed in order to understand if there was a large difference in the number of control and experimental essays exhibiting each level of reflection. Based on insights from these descriptives, a one-tailed t-test was used to understand differences in magnitude of essays displaying transformative critical reflection in both groups.

Results

Interrater Reliability

Three raters coded 20% of the dataset (eight essays) using binary values (0 for the absence of each variable and 1 for their presence). Agreement was calculated using cross tabs in SPSS by computing a kappa value. Between three raters values between 0.6-1 were seen (Table 1) indicating substantial to almost perfect agreement on all four variables (O'Connor & Joffe, 2020).

Table 1: Interrater reliability

Raters	Instrumental Understanding	Instrumental Critical Reflection	Transformative Understanding	Transformative Critical Reflection
R1-R2	1	1	0.6	0.78
R2-R3	1	1	1	1
R1-R3	1	1	0.6	0.78

None of the four variables exhibited excess skewness or kurtosis ($>\pm 3$ and 10 respectively). There was slightly high skewness for instrumental understanding (Table 2). This meant data in the remaining variables were most suitable to conduct t-tests.

Table 2: Descriptive statistics (n = 39)

			Skewness		Kurtosis	
	Mean	*SD*	Statistic	Error	Statistic	Error
Instrumental Understanding	.10	.307	2.726	.378	5.722	.741
Instrumental CR	.28	.456	1.008	.378	-1.040	.741
Transformative Understanding	.31	.468	.867	.378	-1.319	.741
Transformative CR	.31	.468	.867	.378	-1.319	.741

We further computed simple descriptives to gauge if t-tests were warranted owing to a large difference in a magnitude of essays exhibiting a particular kind of reflection. Among 20 experimental participants, 45% exhibited transformative critical reflection (Figure 6) in their essays, while only three of 19 control participants exhibited this reflectivity. Both instrumental critical reflection (criticism of a perspective and unequivocal adoption of an opposing one) and transformative understanding (weighing opposing perspectives without suggestion of an integrated solution) were exhibited by more control group users.

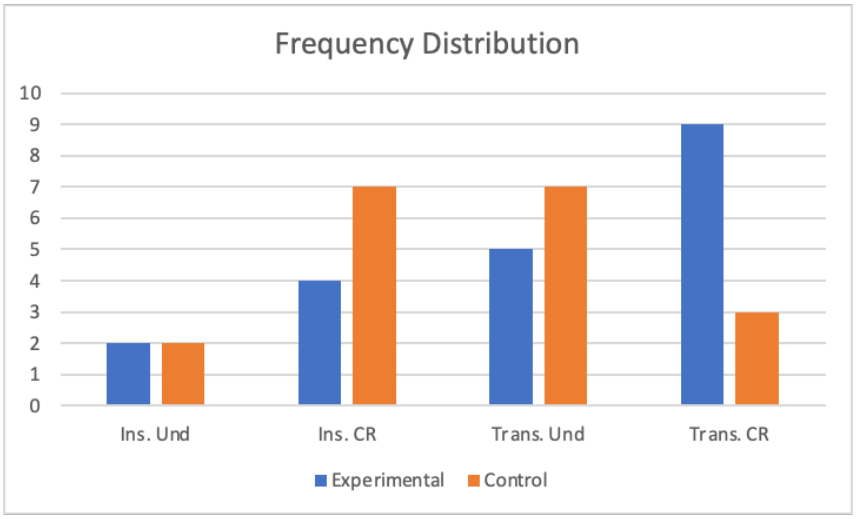

Figure 6: Frequency distribution in both groups

ThoughtShuffler was hypothesized to allow users to write essays about universal and privatized healthcare models in the U.S. context that weighed out varied pros and cons of both models but also suggested a new solution to create change. Such elements in their writing would be emblematic of transformative critical reflection.

The high number of participant essays coded as displaying transformative reflection prompted us to analyze differences between groups for this variable. We also tested differences in the magnitude of instrumental critical reflection and transformative understanding displayed by both groups but found no significant difference.

When we tested for differences in transformative critical reflection, the violation of the assumption of homogeneity of variance indicated by Levene's test for equality of variance [$F(1, 38) =$

5.596, p = .0233], prompted a Welch's t-test (Table 3). Results of the one-tailed Welch's t-test (owing to a directional hypothesis) indicated the number of essays exhibiting transformative critical reflection in the experimental group (M=0.45, SD=0.510) were significantly higher [t(34.835) = -2.044 p = .024] than the number displaying such reflectivity control group (M=0.16, SD=0.375). This supports the hypothesis that using ThoughtShuffler would allow a greater number of participants writing essays exhibiting transformative critical reflection. A Cohen's d of 0.5 indicated a medium effect size for this difference in the number of users (Cohen, 1988).

Table 3: Results of the T-test of Transformative CR

	N	Mean	*SD*	*df*	*t*	*p*
Experimental Group	20	.45	.375	34.835	-2.044	.024
Control Group	19	.16	.510			

Our results displayed that more users interacting with ThoughtShuffler to write argumentative essays were able to explore and reintegrate ideas into nuanced arguments weighing out possibilities rather than adopt one-dimensional answers taking a particular side when compared to Google users. This would mean that the use of ThoughtShuffler can heighten the likelihood for users to engage in transformative reflection in their writing, fulfilling our hypothesis.

Discussion

Our single hypothesis (H1) posits: *a greater number of adult learners/professionals using ThoughtShuffler will exhibit higher-order reflection in writing, compared to those using Google.* Results of our t-tests suggest the interface offered by ThoughtShuffler that makes relationalities between concepts clearer rather than implicit (as in the case of Google's Knowledge Graph functionality) to the user can allow greater efficacy in lateral reading, comparing and contrasting varied sources, and presenting cohesive arguments and actionable solutions to a problem statement. Compared to Google's use, which has been characterized by vertical scrolling, tendency to follow along to the order ranked results (Maynes & Everdell, 2014; Gwizdka & Bilal, 2017), and power browsing to find ideas that solely match one's ideology, the writing produced by users interacting ThoughtShuffler showed greater likelihood to display nuanced reflectivity or transformative critical reflection. User essays weighed the ups and downs related to varied aspects of the healthcare-related prompt, and presented change-oriented solutions that could be applied to the U.S. context. We suggest search trajectories produced through ThoughtShuffler's use have a high likelihood spur transformative learning through human-computer interaction.

While Google has made massive strides in organizing the complexity of online information (Brin & Page, 1998), it may not give enough autonomy to users to engage in lateral reading, guiding users towards answers rather than trajectories of exploration. ThoughtShuffler may help counter concerns arising from filter bubbles on the Internet (Parisier, 2011) and limited engagement with critical analysis while exploring online sources. It does so by offering potential to present search results in varied collections, purely based on the uncertainty and curiosity that collections of concepts pique from users based on inputted and suggested keywords. Studies suggest training users in lateral reading (Wineburg & McGrew, 2017) and nuanced reasoning may help alleviate concerns with a lack of effortful reflection. ThoughtShuffler embodies a solution to this concern and may act as an educational technology that helps create scenarios for students to engage in deeply reflective online searches. Future directions to practically implement ThoughtShuffler include applications to argumentative writing classes focusing on

21st century research skills (Skinnell, 2021) at the college and high school level, to facilitate effortful source comparison in searching for data to refer to while writing.

Limitations

Our study is limited by a small sample of 39 participants. However, since t-tests extend from an in-depth qualitative analysis of each essay written by both control and experimental participants, this sample may suffice to understand quality of argumentative structures in the essays. Further experimentation with new adult participants and younger populations may help understand if reflectivity in using ThoughtShuffler can be generalized across age groups, cultural contexts, and to neurodiverse populations. The research team is aiming to further study the tool's use with late adolescents with learning differences to inform the scope of reprogramming, and ensure it accounts for the widest range of learning experiences. The second limitation is using essays as a unit of analysis. The coding scheme, previously utilized to longitudinally understand reflective qualities of student blogs (Tilak et al., 2020) focuses on general argumentative structure in a text. Sentence-by-sentence analysis of argumentative structure may prove helpful in investigating deeper nuances in reflection produced in our experimental and control groups.

The third limitation is the fact that ThoughtShuffler is still being developed to fine-tune its features for formal deployment. Our study is part of the first iteration of data-driven efforts to investigate its use. While keyword input, tool tips and creating new collections function smoothly, several features (saving searches, author notes) are yet in development. Multiple keyword input and appearance of keywords in each notch sometimes exhibit bugs reported in a few instances. Further analysis of interview data will facilitate effective reprogramming of ThoughtShuffler. The final limitation of this study lies in its goal to understand the use of ThoughtShuffler in a restricted one-to-one human-machine conversational context rather than a naturalistic classroom. Our proposal to further investigate the incorporation of ThoughtShuffler into classes on academic writing and language arts at the high school and college level calls upon a prolific path forward for this research program.

Conclusion

Our results show there is potential for updates in interface design to current search engines like Google. These updates, embodied by technologies like ThoughtShuffler, may encourage users to create nuanced reflective arguments about ideas they search for online. We argue the capacity to weigh varied arguments and integrate ideas is the hallmark of critical reflection, but also can have downstream effects on civil discourse, that allows consideration of the perspective of the other, falsification of one’s own ideas, and creation of informationally healthy social systems. In an era where arguments about issues like climate change, vaccines, and women’s sexual health rights turn into “post-truths”, efficacy for critical reflection and interface designs supporting it may hark upon a more hopeful future in the Information Age.

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Preparing Teacher Candidates for the Post-Pandemic Classroom: Insights through a transformative learning perspective

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Abstract

This study examines the effects of hybrid teaching on K-12 student learning during and after the COVID-19 pandemic, as perceived by Florida's preservice teachers (PSTs). We conducted two mixed-method studies in fall 2020 and 2022, exploring how PSTs' views on teaching and learning evolved in these new post-pandemic learning environments. Using transformative learning theory as our foundation, we analyzed PSTs' experiences as they navigated this shift in education. Initially, PSTs reported concerns about student isolation and focus on hybrid settings. Later, they noted persistent challenges with engagement and academic performance, alongside improved student technology skills. Our findings highlight the need for adaptive teacher preparation programs that address these emerging classroom realities. We propose strategies for enhancing PST training, emphasizing remediation, classroom management, and technology integration. By reflecting on our own transformative education journey alongside our students, we aim to contribute to more resilient and innovative teaching practices. This research offers insights into the enduring impact of the pandemic on education and informs sustainable approaches in teacher preparation for evolving learning environments.

Keywords: Transformative Learning, Post-Pandemic, Learning Environments, Transformative Education

Preparing Teacher Candidates for the Post-Pandemic Classroom: Insights through a transformative learning perspective

Introduction

The pandemic has had a multifaceted impact on both K-12 and higher education. While we cannot yet fully understand the lasting implications the pandemic will have within the field of education, research indicates that hybrid modalities impacted the landscape of our educational communities (Goldberg, 2021). According to the United Nations (2020), school closures due to the pandemic affected 1.6 billion learners from 190 countries, or 94% of the world's student population. In the fall of 2022, the Institute of Education Sciences, a division of the United States National Center for Education Statistics released the first set of findings of the Nation's Report Card since the inception of the pandemic. The report showed the first declines in reading and math scores after the pandemic across the United States, with the largest score drops amongst lower-performing students (United States Department of Education, 2022). These findings corroborated concerns outlined in 2021 by the United States Department of Education in a report titled *Education in a Pandemic,* which stated that

> the educational gaps that existed before the pandemic—in access, opportunities, achievement, and outcomes—are widening... [which] and can be a cause for great concern, especially when they interfere with a student's opportunity to learn, grow, and contribute to our nation's future. (United States Department of Education, 2021, p. ii)

Further, the *Education in a Pandemic* report also stated some startling facts: in May 2020, only 15% of elementary school districts in the United States "expected their elementary students to be receiving instruction for more than four hours per day during remote learning" and 17% reported that instruction in spring of 2020 was "designed not to teach new skills and understanding, but to review what had already been taught—in a sort of pandemic holding pattern" (United States Department of Education, 2021, p.2).

However, these problems were not isolated to the 2019-2020 school year, rather, they persisted throughout much of the following school year as well. Additional reports on the impact of the pandemic on student learning indicated that although 67% of adult respondents who had children enrolled in public and private schools in the United States relayed that their students' classes had shifted to a distance learning format at the beginning of the 2020-2021 school year, only 59% reported that the school districts provided computers and internet access to students engaged in distance learning (Irwin et.al, 2021). A whitepaper from the McKinsey group found that worldwide access to high caliber hybrid learning differed "across and within countries" which led students globally to be an average of eight months behind where they would have been had the pandemic not occurred (Bryant, 2022). These outcomes are in direct opposition to the United Nation's Sustainability Development Goals (United Nations Statistics Division, 2023) which recently updated sustainability efforts in education to "ensure inclusive and equitable quality education" via indicators such as access, quality, and increased proficiency in literacy and math. Students in higher education also struggled to find equitable access to technology during the pandemic and reported lower academic performance (Faura-Martínez et al., 2022); seemed to be less engaged in their studies and had insufficient social support from classmates and instructors during the pandemic (Cifuentes-Faura et al., 2021); and reported learning less and rated their learning during the pandemic as fair or poor (Ezarik, 2021).

This manuscript relays the findings of two mixed-method phenomenological research studies that explored the impact of the hybrid teaching model and perceived K-12 student learning amongst preservice teachers (PSTs) within the state of Florida. According to US News and World Report (n.d.), Florida ranks sixteenth in the nation for their public K-12 scores, yet they came in first place for higher education offerings rounding out to an overall score of third place across the United States. In this manuscript, our aim was to investigate the difference in educational offerings cited in United Nations sustainability reports through the lens of preservice teachers (PSTs) enrolled in a teacher preparation program during two distinct time frames: fall 2020 and fall 2022. Additionally, we will provide valuable suggestions and considerations for higher education faculty involved in teaching preservice education programs.

Utilizing Mezirow's (1991/2009) phases of Transformative Learning as the theoretical framework, findings suggest implications in sustainability practices in teaching and learning were evident. Transformative Learning posits that learners will reconsider their beliefs when adjusting to a new experience, such as the initial shift to hybrid modalities and continued remediation efforts. Specifically, we were interested in exploring the continued instructional implications of teaching and learning within the K-12 post-pandemic classroom. Study 1 (2020) was designed to address the initial phases of Mezirow's Transformative Learning, where learners often find themselves in a process of reconsidering beliefs as they adjust to a significant situation, such as the initial shift to hybrid modalities many experienced during the pandemic. This adjustment often leads to transformation, and we sought to explore some of the issues surrounding the cognitive dissonance/transformation aligned to hybrid learning in our teacher preparation program. Study 2 (2022) sought to expand our initial insights and explore Mezirow's later stages (1991/2009) where learners are actively aware of their transformation as they investigate their new roles and obtain the understanding and expertise necessary to plan new courses of action. Our reflections suggest higher education faculty should be involved in a dynamic process of transformation alongside our students to ensure sustainability efforts in teaching and learning. This continued work is

critical to the United Nations Development Programme's (UNDP) goal of ensuring equitable education by increasing the "supply of qualified teachers." If we are to improve the sustainability of education for all, one important indicator is high-quality intentional teacher training.

Literature Review

During the pandemic, preservice teachers reconsidered their beliefs regarding teaching and learning as they adjusted to the new experience of hybrid teaching. Post-pandemic, preservice teachers reported on what they are currently experiencing in the classrooms based on perceived notions of previous hybrid instruction. Mezirow's Transformative Learning Theory (TLT) (1978) was utilized to undergird our analysis of the data.

Transformative Learning Theory

Jack Mezirow's Transformative Learning Theory was used as the theoretical framework for these studies. TLT was first conceptualized in 1978 and has undergone several reiterations, culminating with Mezirow's own 2009 overview, which we utilized in this study. According to Mezirow (2009),

> Transformations may be epochal—sudden major reorientations in habit of mind, often associated with significant life crises—or cumulative, a progressive sequence of insights resulting in changes in point of view and leading to a transformation in habit of mind.

As such, TLT is especially salient to this study as we explored teaching in a time of great upheaval, such as the sudden shift in teaching and learning experienced during the pandemic, but also during post-pandemic teaching where change is still ongoing.

Mezirow (2009) holds that TLT is a theory connected to examining one's identity and that the process is metacognitive. There are ten phases to TLT, however, in this manuscript, we focused on the first seven phases of transformation: a disorientation dilemma, self-examination, critical assessment of assumptions, recognition of transformation, exploration of options, planning a course of action, and acquisition of knowledge and skills (Mezirow, 2009). According to the theory, learning begins with an experience that leads to a "disorienting dilemma." We theorise that the abrupt shift to hybrid teaching was one such disorienting dilemma experienced by our participants that catapulted them into an epochal transformation (Phase 1). As they reconsidered their beliefs as they adjusted to these new experiences and dilemmas, a process of self-examination (Phase 2) and a critical assessment of assumptions (Phase 3) was underway. Our initial study saw evidence of Phases 1-3, whereas it was not until the second study that we saw evidence of more advanced stages of transformative learning emerge from Phases 4- 7 (see Figure 1).

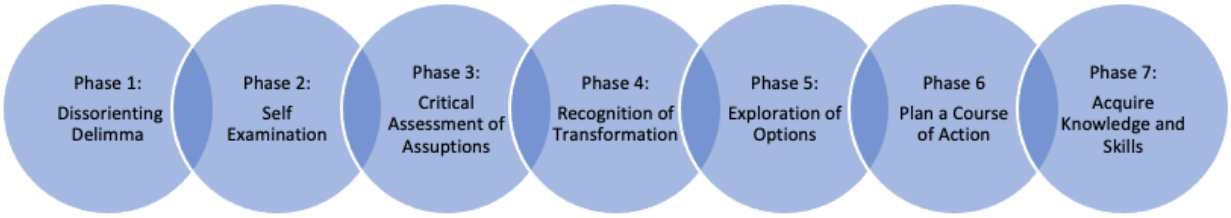

Figure 1. Mezirow's Phases of Development (2009)

Hybrid Learning

Hybrid learning is an educational model that incorporates technological tools and online elements to facilitate learning in place of traditional in-person instruction (Singh et al., 2021). When the pandemic emerged, schools faced the need to reimagine their teaching methods, and hybrid learning quickly became a popular choice. Its appeal was attributed to the flexibility it offered in terms of time, space, and pace of learning, especially during such unprecedented times (Xiao et al., 2020, p. 1204). However, the abrupt transition to hybrid learning posed challenges. Schools had little time for well-planned instructional design due to the immediate nature of the pandemic's impact (Hodges et al., 2020). The shift was chaotic, lacking in professional development and comprehensive curriculum maps (Ali, 2020; Howard et al., 2021). Many school districts adopted hybrid models uncertain of how long they would be necessary. In our study, we utilized a Likert scale with five metrics, including Strongly Agree, Agree, Undecided, Disagree, and Strongly Disagree, to assess preservice teachers' perceptions of hybrid teaching modalities on K-12 student learning during and after the pandemic. The Likert scale was accompanied by constructed responses to provide additional context for the scale ratings. Nevertheless, this widespread adoption highlighted critical areas for educational improvement. One significant issue that surfaced is the need for equitable access to education for all K-12 students (American Association of School Administrators, 2020; American Academy of Pediatrics, 2020; Darling Hammond, 2020; United Nations, 2023). Equitable access is a foundational tenet outlined by the UDNP (United Nations, 2023), crucial for achieving sustainability in education and providing lifelong learning opportunities for everyone.

Teaching and Learning Disorientation

The COVID-19 Pandemic caused schools to close, restructuring teaching and learning platforms to online or hybrid formats. Abruptly shifting these reinvented learning spaces challenged the norm for conventional education settings. Millions of students experienced an interruption in learning from absenteeism, decreased learning times, and lack of technology, teacher training, and support (Anderson, 2020). Teachers are confronted with a disorienting dilemma; as a result of the sudden transfer of developing new spaces for teaching and learning, their experiences may not fit into current beliefs, values, assumptions, or practices of teaching and learning experienced during the onset of the Pandemic (Mezirow, 2009).

One of the groups uniquely impacted by this disorientation was preservice teacher candidates. At a time when they were still learning about how to teach in traditional schools, they too were catapulted into chaos. Yet, in contrast to in-service teachers, these preservice teachers were still trying to figure out what it meant to be a teacher in K-12 schools. Furthermore, Buschelman (2020) explored the unique experience that preservice teacher candidates faced post-pandemic, offering that field-based experiences were both tumultuous yet offered "the opportunity for great growth" (p. 146). In this vein, Garcia and Weiss (2020) note the "emergency remote teaching" implementation hindered teacher professional development. The systematic and routine exploration of instructional routines during this time has yet to be determined. Furthermore, the quality and methods of teaching may also give rise to largely unexplored questions connected to teacher preparation and training during the pandemic impacting plans on the development of comprehensive strategies to support contingency planning. Therefore, the research on what alternative instructional methods and modes work and how these structures align with our teaching beliefs and practices are highly encouraged to inform the field of education. The necessity for recovery during this time should begin to explore new or reimagined learning modes that can reach all students while promoting a system of resiliency (Azz-Huck, & Shmis, 2020). Further, to help teacher candidates move beyond "crisis management" towards transformation and sustained professional growth, continued reflection was found to be a crucial factor (Burn et al., 2022). Reflection is an embedded component in Mezirow's TLT; reflection is necessary and aids individuals as they experience a shift in their thinking once they encounter a "disorienting dilemma" and move towards transformation (Mezirow, 1991/2009).

Method

In this manuscript, we examined the results of two distinct mixed-method phenomenological research (MMPR) studies exploring the impact of hybrid teaching model and perceived K-12 student learning amongst preservice teachers (PSTs) within the state of Florida. We define the hybrid learning model as the choice for students to attend in person by physically being present on the school campus, while others have the alternative to participate remotely through virtual platforms such as Zoom, Microsoft Teams, or Google Meet in a synchronous fashion. In K-12 settings, hybrid learning provided students and their families the flexibility to decide whether to attend classes in person or engage remotely, according to their preferences and circumstances during the pandemic. Additionally, it presented teachers with the opportunity to blend traditional face-to-face teaching methods with digital tools to enhance student learning. Our research had a limited sample size, making generalization challenging. However, the data we collected from hybrid learning provided valuable insight into the disparity in educational offerings mentioned in United Nations sustainability reports.

We focused on data from preservice teacher candidates (n=45 in 2020, n=13 in 2022) at two time points: fall 2020 (study 1) and fall 2022 (study 2). In 2020, we distributed the survey to all current students in our educational program, and we followed up with the same sample in 2022. The response rate for the follow-up survey was lower, mainly due to some students having graduated from the program and attrition. In both study 1 and study 2, we developed research questions that explored how preservice teachers described the perceived influence of hybrid teaching modalities on K-12 student learning during and post-pandemic. The survey was sent to all education students at our university's educational centers in the Central, West Central, North Central, and North-eastern regions of Florida. In study 1, the survey included five metrics using a Likert scale, with constructed responses providing additional context for the scale ratings (ranging from Strongly Agree to Strongly Disagree). In study 2, we solely used constructed responses to gain insight into the impact of previous hybrid instruction during the pandemic on teaching and learning in post-pandemic classrooms. These results provided a better understanding of the pandemic's impact on student learning from the perspective of preservice teachers, offering a more holistic view of its perceived implications.

The amalgamated data from our findings in study 1 allowed us to highlight and address issues surrounding the “disorienting dilemma” of hybrid teaching through the theoretical frame of Transformative Learning (Mezirow, 1991/2009). The increase in demand for hybrid teaching models and the relative stressors caused by such striking changes and demands to conventional teaching methods led our participants to self-examine their beliefs on teaching and learning to critically assess their previously held assumptions. Our findings from study 2 assisted in providing insight as to the impact of the pandemic in current classrooms and the new roles, target areas in promoting change, and reflection on supports need to actively situate the changes necessary for the post-pandemic classroom. Since the onset of the pandemic, our educational institutions have faced and continue to face changes that have challenged some of the most conventional theories and practices governing almost every aspect of educational delivery.

This two-stage study examined this initial period in which preservice teacher candidates reconsidered their beliefs by first understanding some of the issues surrounding the cognitive dissonance aligned to the hybrid learning shift. This study also aimed to provide an understanding of hybrid learning pedagogy, perceived impact on student populations, and teaching and learning from the lens of preservice teachers. By reporting on this transformation, we can begin to understand the impact of the pandemic on teaching and learning and how to better support our PSTs in this time of recovery.

Research Design

We explored the shared phenomenon as an approach to describe the transformative learning experience that preservice teachers shared as they traversed the impact of hybrid learning both during and post-pandemic. This research sought to explore the ‘shared experiences and understandings of educational professionals as they navigated the new experience of hybrid learning (Ezzy, 2002). Using an MMPR

approach aided in highlighting the participants' unique and "subjective experiences" (Bogdan & Biklen, 2003) by capturing those transformative moments within teaching and learning. Using a phenomenological lens aided us as we sought to understand and accurately analyse the shared experience that was being described regarding cognitive dissonance and disorientation to assist with our understanding of this transformative learning experience. We followed the definition of the mixed method research offered by Tashakkori and Teddlie (1998) where data, findings, and inferences are informed by both the qualitative and quantitative data collected, enabling us "to obtain different but complementary data on the same topic" (Morse, 1991, p. 122). Similarly, Creswell and Plano Clark's (2006) mixed methods triangulation method models propose the researchers "collect and analyse qualitative and quantitatively data separately on the same phenomenon and then different results are converged by comparing and contrasting the different results during the interpretation" (p. 64). Mayoh and Onwuegbuzie (2015) provide a conceptualization for using MMPR in practice when looking for "one method to inform another" because "the strength of quantitative research (identifying common aspects of a phenomenon) is used within a phenomenological framework to provide orientation and focus to a study where the phenomenological method is dominant" (p. 99). The use of the MMPR lens was specifically helpful in our design because we wanted to both understand the lived experience of any perceived 'disorientating dilemmas 'perceived by our participants and use these to develop an intervention in the latter application of our findings. The MMPR lens allowed us to honor the first-person lived experience "on its own terms" while infusing quantitative data to capture the perceived influence upon student learning.

Results

Likert Scale – Study 1

In study 1, Survey Questions (SQ) 1 and 3, PSTs were asked to rate their response utilizing a 5-point Likert scale. The responses ranged from (1) Strongly Agree; (2) Agree; (3) Undecided; (4) Disagree; (5) Strongly Disagree. Utilizing simple descriptive statistics, these ratings from *Strongly Agree* to *Strongly Disagree* for each SQ are presented below.

SQ 1. Hybrid teaching modalities have negatively impacted K-5 student learning during the 2020 school year.

Overall, the sample indicates that 65% of PSTs surveyed agree that hybrid teaching has had a negative impact on teaching, with 25% rating their response as *Strongly Agree.* The category of preservice teachers rating their response as *Undecided* was 22% indicating that there may be a positive or negative impact, but neither was obvious during classroom instruction. Within the *Disagree* category, 13% of PSTs felt there were no negative impacts within classroom instruction observed during the school year, with a 0% rating in the category of *Strongly Disagree* (see Figure 2).

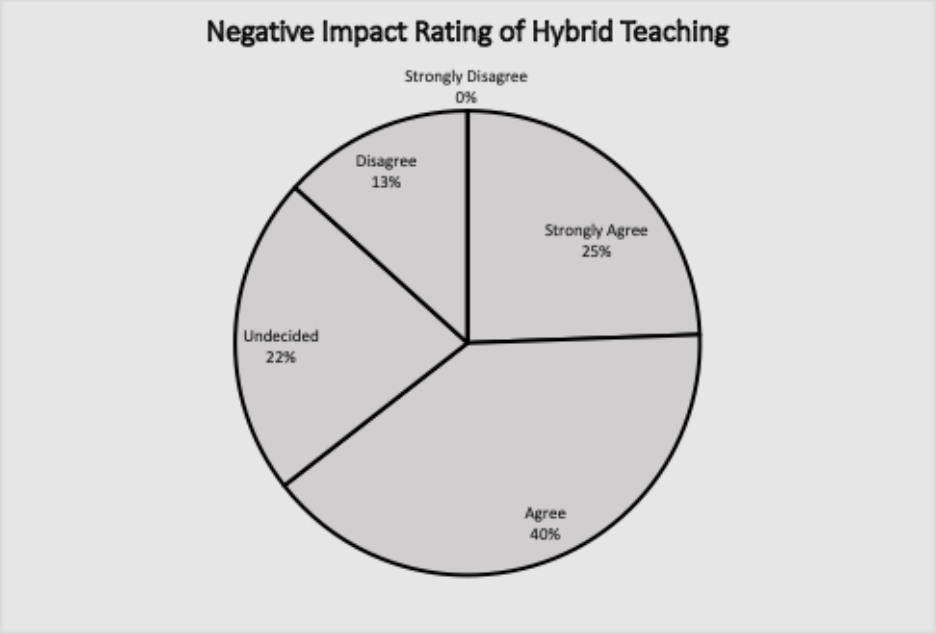

Figure 2. Negative Impact Rating of Hybrid Teaching

SQ 3. Hybrid teaching modalities have positively impacted K-12 student learning during the 2020 school year.

Overall, the sample indicates that 24% of PSTs surveyed agree that hybrid teaching has had a positive impact on teaching, with 2% rating their response as *Strongly Agree.* The category of preservice teachers rating their response as *Undecided* was 36% indicating that there may be a positive or negative impact, but neither was obvious during classroom instruction. Within the *Disagree* category, 40% of PSTs felt there were no positive impacts within classroom instruction observed during the school year, with 16% rating their response as *Strongly Disagree*. To provide a deeper understanding of the rating for Question 3, PSTs were asked to provide a constructed response statement to justify their response (see Figure 3).

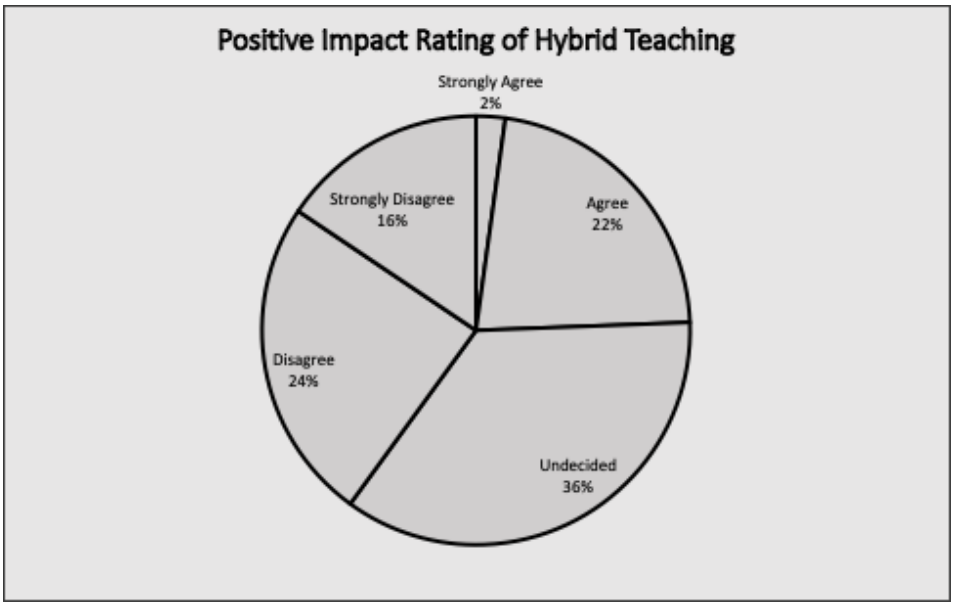

Figure 3. Positive Impact Rating of Hybrid Teaching

Constructed Responses – Study 1 and Study 2

Data collected from study 1 provided the PSTs with the opportunity to *explain* their ratings in the form of constructed responses for the Likert Scale questions above. The constructed responses in study 1 provided insight into the Likert scale ratings qualitatively. Additionally, in Study 2, constructed responses were utilized solely to provide insight gleaned from previous hybrid instruction during the pandemic and the impact on teaching and learning in the post-pandemic classroom. In Study 2 an additional question was asked in the form of a "follow-up" question to provide a clear understanding of PSTs' decision-making processes corresponding to their responses. To support each themed category, we selected participant responses that captured each themed category by the highest number of references when coded. The analysis of the data provided from the constructed responses into SQ 2 in study 1 and study 2 assisted in the development of themed categories for analysis during the coding process. Each theme was then quantified by the number of times identified within each PSTs' response.

In study 1, the largest percentage of Likert Scale responses aligned to *Strongly Agree and Agree. T*he emergence of themed categories, from the constructed responses aligned to, *Social Emotional/Group work, Distractions, Focus, and Home Environment and Non-participatory/Non-active Roles/Motivation low* rated the highest number of references when coded in the sample responses. According to our participants, the shift to hybrid learning has negatively impacted student achievement in three main areas noted above. First, PST responses indicated that reduced in-person collaboration and group work minimized social-emotional development and peer engagement. Additionally, responses indicated that PSTs felt home environments often lacked necessary support systems and structure, which amplified student struggles with concentration and self-regulation. Finally, comments indicated that predominantly passive online instruction diminished student participation, hands-on practice, motivation, and retention. In these ways, hybrid models failed to facilitate interactive learning, classroom community, and relationship building. Students disengaged without sufficient prompting, participation, or guided support. By not adequately addressing these community, environmental, and methodological pitfalls, hybrid modalities seemed to hinder student learning across domains (see Table 1).

Table 1. Categorical Themes and Sample Responses for SQ2

Study 1 - SQ 2. *In what ways have hybrid teaching modalities negatively impacted student learning? Explain below:*
Categorical Themes
1. Social Emotional/Group work
2. Distractions/Focus/Home Environment
3. Non-participatory/Non-active Roles/Motivation low
PST Sample Responses
"Motivation seems to dissipate when being online. It leads to easy distractions, ultimately making learning difficult." *"Students do not have the concentration skills to learn everything on their own.*" *"Children at home often do not have support systems in place to assist them through their school day. If caretakers are not able to keep them on track, some students are unable to regulate their day appropriately."* *"The student-teacher, student-student interaction is minimal."* *"Strategies that work in person do not necessarily work online, and vice versa."*

In study 2 the themed categories from the constructed responses aligned to, *Lack of Focus/Engagement, Lower Level/Lack of Learning, and Low Social Skills* rated the highest number of references when coded. In Study 2, a supplementary question was introduced to gain further understanding of PST perceptions regarding the link between hybrid teaching methods and perceived adverse effects on student learning (SQ 2). This question aimed to explore instructional decisions made

by PSTs, aligning with the insights provided by them. These constructed responses were directly connected to the reporting of what the PSTs had done *differently* to support the negative impacts on teaching and learning after the pandemic. The themed categories, *Lack of focus/Engagement, Low Level/Lack of Learning and Low Social Skills* remerged as the ones with the highest number of references during coding.

Teacher candidates reported observing significant negative impacts on student learning stemming from previous hybrid model instruction. Most notably, PSTs reported that students demonstrated a pervasive lack of focus and short-term engagement in lessons. As a result, veteran teachers often resorted to only instructing small groups, providing minimal retention in whole-class settings. Academically, PSTs noted that students appeared and tested behind grade level across subject areas. Socially, diminished interpersonal skills hinder teamwork and peer relationships. Students required substantial prompting to start assignments, displaying reduced attention spans, intrinsic motivation, and persistence. In these responses, PSTs perceptions indicated that the residual effects of passive hybrid learning continued handicapping student achievement, participation, collaboration, and socioemotional growth. Addressing these engagement and skill deficits remains imperative for teacher candidates moving forward (see Table 2).

Table 2. Study 2 Categorical Themes and Sample Responses for SQ2

Study 2 - SQ 2. *In what ways do you perceive that previous hybrid teaching modalities **negatively** impacted student learning based on what you are seeing in your placement (e.g., CT discussions, student observations)? Explain below:*
Categorical Themes
1. Lack of focus/Engagement
2. Low Level/Lack of Learning
3. Low Social Skills
PST Sample Responses
"I am seeing a large lack of focus and short-term engagement for students across grade levels. My CT, who is a veteran teacher, will only teach to small groups in rotations due to the lack of learning that seems to be received by students in a whole group setting." *"The social skills of students seem very low which negatively impacts their personal relationships and teamwork. Academically, several students appear, and often test, one to two grade levels below."* *"Students are reluctant and slow to start on writing assignments. They also struggle with engagement and motivation to get started. I think from using hybrid teaching, students developed a shorter attention span and have less intrinsic motivation."*

In the following table, we presented insights derived from participants in Study 2 through constructed responses. These insights delved into their experiences with hybrid instruction during the pandemic and its implications for teaching and learning in the post-pandemic classroom. Additionally, we explored PSTs' decision-making processes through a follow-up question, which asked them what they have done differently in response to these insights. The participant responses highlighted in the table represented various thematic categories, selected based on their frequency during coding. The themed categories, *Remediation, Engagement/Classroom Management and Cooperative Learning/Peer Discussions* emerged with the highest number of references during coding.

Teacher candidates indicated making several instructional shifts based on observing the lingering impacts of hybrid learning. They often remediated by teaching content below grade level across the board to account for noted deficits. Additionally, PSTs noted that creative engagement strategies helped reactivate student focus, participation, and enjoyment in lessons. Candidates also prioritize cooperative structures like peer discussions to rebuild collaboration and interpersonal skills. However, based on PST

responses classroom management remained challenging amidst these efforts. Despite candidates tailoring remediation, activities, and groupwork to support students, undoing the effects of passive hybrid learning persisted as an uphill battle. Teacher preparation programs must continue emphasizing engagement and relationship-building strategies to equip future educators for these realities (see Table 3).

Table 3. Study 2 Follow-up Question Categorical Themes for SQ2

Study 2 – Follow-up Question SQ 2. What have you done differently because of these insights in your teaching? Explain below:
Categorical Themes
1. Remediation
2. Engagement/Classroom Management
3. Cooperative Learning/Peer Discussions
PST Sample Responses
"Yes, I find myself teaching more content based on lower grade ability to the whole class than I expected. Also, my CT has found classroom management implementation challenging so it tends to make it more difficult on me during my 8 hours a week. I feel like I spend as much time redirecting poor choices as I do teaching." *"I have been implementing creative practices into my lessons and the students are finding engagement once again; I think we need to do a little unwinding of the last three years."* *"Yes. Through my own course discussions as well as my own lesson plans, I have placed an extended emphasis on collaboration and peer discussion in the classroom to allow students the opportunity to practice these skills."*

An analysis of the data provided from the constructed responses for SQ 4 in study 1 and study 2 assisted in the development of themed categories for analysis during the coding process. Each theme was then quantified by the number of times identified within each PSTs' response. In study 1, the largest percentage of Likert Scale responses aligned to *Undecided.* The emergence of themed categories from the constructed responses aligned to, *Safety (due to pandemic), Learning Styles/Needs, and Social Emotional* rated the highest number of references when coded in the sample responses.

While predominantly negative, PSTs do identify some potential benefits of hybrid learning modalities. Primarily, keeping students home ensured safety amidst health concerns like the pandemic. Additionally, hybrid options allowed for more personalized learning tailored to unique styles and needs. For example, fully online formats better served students with anxiety who struggled socializing. However, PSTs overwhelmingly noted those advantages only applied to a small percentage of learners. Their responses indicated that they perceived that most students required in-person peer collaboration and teacher support to sufficiently progress. Therefore, while hybrid instruction may have provided some differentiation support, the majority of students seemingly depended on school community and structure for academic growth and socioemotional development (see Table 4).

Table 4. Study 1 Categorical Themes and Sample Responses for SQ4

Study 1 - SQ 4. *In what ways have hybrid teaching modalities positively impacted student learning? Explain below:*
Categorical Themes
1. Safety (due to pandemic)
2. Learning Styles/Needs
3. Social-Emotional

PST Sample Responses
It has been easier on some parents to keep their students home. Students are safe in their own home, and can get into a routine. *"There are clear benefits and draw backs, but it is going to be radically different for each student and their learning styles/needs."* *"There are some students who are able to handle the course load work entirely online and keep up with their grades, but I am only seeing a small percentage of students being able to do that. Another thing that I can't decide on is that impact this has with socialization for students who have anxiety this hybrid learning is a dream sent, but it is necessary for students to interact with each other, and they can only do so much via online."*

In study 2, the emergence of one themed category from the constructed response, *Technology* rated the highest number of references when coded. In study 2, a follow-up question provided additional insight to SQ 4 related to instructional decisions that supported the insights reported by PSTs. These constructed responses are directly connected to the reporting of what the PST has done *differently* to support the positive impacts in teaching and learning post-pandemic. The themed category, *Technology* emerged with the highest number of references during coding.

Despite broader challenges, teacher candidates noted one clear positive outcome of hybrid learning – increased student technology skills. Candidates observed learners efficiently navigating laptops, learning platforms, and digital tools independently. They highlighted how earlier hybrid instruction necessitated students developing self-sufficiency online to access materials and complete assignments. While technology cannot wholly replace in-person teaching, this fluency better prepares students for leveraging digital resources purposefully. Moving forward, teachers can build on this baseline to integrate technology in meaningful ways that enhance, rather than replace, hands-on learning. With guidance, students' tech-savviness provides promising foundations for more responsive blended instruction (see Table 5).

Table 5. Study 2 Categorical Themes and Sample Responses for SQ4

Study 2 - SQ 4. *In what ways do you perceive that previous hybrid teaching modalities* ***positively*** *impacted student learning based on what you are seeing in your placement (e.g., CT discussions, student observations)? Explain below:*
Categorical Themes
1. Technology
PST Sample Responses
"Students are well aware of technology and the era in which they are living. It is necessary to become fluent in using technology, however, there should be limits to these usages. I do see the positive of students knowing how to help themselves, especially should we need to move into remote learning again. Students know how and where to log in, and where to find assignments to complete." *"Students can navigate their laptops fairly well on their own. They also have an awareness of how technology can be used for learning."* *"Students are increasingly more prepared for technology usage in the classroom."*

In the following table, we present insights drawn from participants in Study 2 through their constructed responses. These insights shed light on their experiences with hybrid instruction during the pandemic and how it has influenced teaching and learning in the post-pandemic classroom. Additionally, we delved into the decision-making processes of preservice teachers with a follow-up question, prompting them to share any adjustments they have made in response to these insights. The participant responses

highlighted in the table encompass various thematic categories, selected based on their frequency during coding. The emergence of one themed category, *Technology* rated the highest number of references when coded.

Teacher candidates indicate leveraging students' strengthened technology skills by integrating digital tools more frequently in instruction. While using technology sparingly and purposefully, they created interactive Nearpod lessons and self-paced learning through educational programs. However, candidates balanced this with hands-on creative assignments to maintain engagement and comprehension. In this way, they built on the baseline tech fluency students developed through earlier hybrid model instruction, while still prioritizing tangible skills practice and relationship-building. As candidates prepared to lead their own future classrooms, these insights help shift perspectives on responsive educational technology integration to enhance, rather than replace, in-person learning (see Table 6).

Table 6. Study 2 Follow-up Question Categorical Themes for SQ 4

Study 2 – Follow-up Question SQ 4. What have you done differently because of these insights in your teaching? Explain below:
Categorical Themes
1. Technology
PST Sample Responses
"I have implemented both hands-on creative assignments into my teaching, along with creating my own Nearpod assignments with formative assessments that integrate the technology through a Time to Climb quiz. I find the right content for the correct implementation, and instead of using it for every lesson, I would use it sparingly." *"I ended up incorporating that tech piece more often than I thought I would when coming into the program."* *"Increased use of technology."* *"Incorporated more technology in my lessons."*

Discussion

The onset of the pandemic and the abrupt shift to hybrid learning models have had a lasting impact on our nation's schools. Mezirow's (1991/2009) Transformative Learning Theory holds that as adults adjust to new experiences, they will reconsider their beliefs. The present two-stage study examined the beginning phases of reconsidering beliefs about how students learn exhibited by our preservice teacher participants as they were first understanding some of the issues surrounding the cognitive dissonance aligned to hybrid learning. The analysis of both qualitative and quantitative data assisted in uncovering PSTs' previous experiences during the pandemic and current assumptions post-pandemic related to teaching and learning in the hybrid environment. This was important to understand so we could better assist with any pedagogical shifts that needed to occur in the classroom to support post-pandemic teaching and learning. Within the first study, we saw evidence of the first three phases of Mezirow's TLT phases 1-3, initial disorienting dilemma, self-evaluation, and critical assessment of assumptions. Our second study provided us with evidence of phases 4-6 of Mezirow's TLT: recognition of transformation, exploration of options, plan a course of action, and acquiring knowledge and skills. A cross-analysis of PST comments aligned to Mezirow's initial seven phases assist in exploring elements of critical reflection to provide insight for support in educational program preparatory courses aligned to the needs of PSTs to serve our K-12 learners (see Table 7).

Table 7. Transformative Learning phases and sample responses (adapted from Beer 2019)

Mezirow's Phases of Development	Description of Phase	Comments Aligned to Phase
Phase 1: Disorienting Dilemma	An experience that does not fit with one's expectations. A resolution happens when the person changes their view of the world.	*"Strategies that work in person do not necessarily work online, and vice versa."* *Another thing that I can't decide on is that impact this has with socialization for students who have anxiety this hybrid learning is a dream sent, but it is necessary for students to interact with each other, and they can only do so much via online.*
Phase 2: Self Evaluation	Reflection of one's feelings about the dilemma (usually feelings of shame or guilt).	*I feel the social/emotional impact this pandemic has had on students has been immeasurable. I think hybrid learning modalities were implemented with the hope of maintaining a sense of normalcy for students while also attempting to provide the highest possible level of education from the safety and comfort of their homes.* *I feel that there are benefits to hybrid teaching, but like all things with education things that could be seen as negatively impacting some students could positively impact other students. I feel that hybrid learning allows for students to learn in a safer environment in terms of COVID.*
Phase 3: Critical Assessment of Assumptions	Through reflection, identification, and analysis of limiting assumption e.g., what does it mean to you to feel this?	*Students fell behind in the content that needed to be learned. Students learn best in the classroom and need to be face-to-face all the time. I noticed in my practicum that students' basic math skills in an upper level were not high. A lot on the hybrid really didn't focus like they should and I feel barely listened.* *There are some students who are able to handle the course load work entirely online and keep up with their grades, but I am only seeing a small percentage of students being able to do that.*
Phase 4: Recognition of Transformation	The emergence of thought as to how this could be different by engaging in new roles.	*In returning to schools, students in our district are now 1:1 on devices; this is interestingly enough becoming too tied into daily routines. I do not believe every lesson should be integrated into technology, however, this is what I am seeing. I have been implementing creative practices into my lessons and the students are finding engagement once again.* *I find myself teaching more content based on lower grade ability to whole class than I expected*
Phase 5: Exploration of Options	Target areas in promoting change, analyzing the dangers/benefits of	*Through my own course discussions as well as my own lesson plans, I have placed an extended emphasis on collaboration and peer discussion in the classroom*

Mezirow's Phases of Development	Description of Phase	Comments Aligned to Phase
	staying the same/changing.	*to allow students the opportunity to practice these skills*
Phase 6: Plan a Course of Action	Identifying what one needs to know/ accomplish/overcome for change to occur.	*I want to try to implement new ideas, however, there does not seem to be much room for this with the district and administration adding in more and more frequent testing days*
Phase 7: Acquire Knowledge and Skills	Actively situating the understanding to make the necessary change	*I have become an expert in pivoting my instruction and honing in on the needs of my students in the moment. I have done additional research, especially YouTube examples, of more management and SEL strategies.* *I am interacting with the children and getting to know them.* *I have been pre-teaching beginning concepts so that grade-level concepts can be understood.*

During the pandemic, study 1 captured PSTs' negative views of hybrid instruction by noting students were isolated impacting social and emotional needs. Furthermore, the home environment may have been distracting, causing students to lose focus and not pay attention to the instruction delivered. This lack of focus may factor into the lack of motivation and engagement that reportedly declined when learning in the hybrid modality (Mezirow's Phases 1-3). In study 2, the negative views of *previous* hybrid instruction connected directly to the concerns reported from study 1 by noting a continued concern about engagement and focus during post-pandemic instruction. Furthermore, PSTs noted that students are below grade level expectations and are demonstrating social/emotional behaviors that are reportedly low. In study 2, the follow-up question, "what have you done differently because of these insights in your teaching" PSTs noted, a focus on remediation for content, a higher emphasis on classroom management techniques, and the integration of cooperative learning/peer discussions (Mezirow's Phases 4-7).

Aligned to the *positive* views of hybrid instruction during the pandemic from study 1. PSTs noted students were safe in a time of uncertainty related to health concerns. Furthermore, PSTs reported how students may have benefited by learning in a more isolated environment compared to the classroom environment where aspects of socializing and group work are required (Mezirow's Phases 1-3). Interestingly, in study 2, the *positive* views of hybrid instruction seemed to have shifted to technology specifically. PSTs reported increased use of technology in the classroom during post-pandemic instruction. Many remediation programs that are online track progress and assign remediation lessons based on student needs. PSTs also noted that K-12 students are much more proficient in technology in the post-pandemic classroom with navigating laptop use to include logins and finding/completing assignments. In study 2, the follow-up question, "what have you done differently because of these insights in your teaching" PSTs noted, the integration of technological supports for post-pandemic classroom instruction as a method of formative assessment. PSTs also noted that they ended up incorporating more technology than they thought would be required during their instructional experiences in the classroom (Mezirow's Phases 4-7).

Conclusion

A deeper understanding of our PSTs' journey of transformation during this time assisted in providing us with the awareness that we too were experiencing the phases of transformative learning with our students. Vygotsky (1978) noted, "Through others, we become ourselves." Within this vein, a reflection of our instructional practices mirrored a similar state of dissonance. This mirroring of

experiences and pedagogical shifts has helped us to understand how to better serve our PSTs during this time of recovery in the K-12 classroom. Higher education institutions play a critical role in promoting sustainability practices by promoting reflective practitioners. Encouraging preservice teachers to regularly engage in self-reflection on their teaching methods, student interactions, and instructional strategies is key to achieving this goal. Additionally, integrating technology and arts into education are further sustainability practices that hold much potential during this time of recovery. Effectively incorporating technology and infusing arts in the curriculum empower preservice teachers to enrich student engagement, creativity, and foster critical thinking skills (Capone and Leopre, 2021; Hirsh and Baronak, 2020; Long, 2022). These practices align with areas of future research opportunities, providing avenues for exploring Mezirow's later phases of transformative learning (Phases 8-10), which encompass trying new roles, building self-efficacy, and finally achieving reintegration.

As we actively situate our PSTs' needs to facilitate sustainable teaching and learning practices, we are beginning to understand that an increase in technology integration into our course instruction is needed, with a clear connection to lesson planning and reflection. We also embedded supports in our courses and adjusted our instruction to include an increased emphasis on classroom management techniques aligned with student sense of belonging and social-emotional learning strategies. Aligned to both the lower ability, learning, and engagement amongst students reported by our PSTs, we have begun adding instructional course supports that integrate authentic arts-infused literacy strategies to complement the application of intensive remediation efforts. As a result, we designed a third intervention study focusing on bridging K-12 teaching with arts-infused instructional support for entry-level teachers. We are offering this support to entry and beginning teachers who seem to be struggling with reconciling best practices with what they are experiencing in their post-pandemic classrooms. Through this intervention process, we hope to address the dissonance experienced as PSTs prepare to remediate learning loss that occurred during school closures or while in-between hybrid and in-person modalities (Engzell, et al., 2021; Spector, 2021).

As we embark on this journey with our students, we feel that critical reflection is needed as instructors of future teacher candidates. The UDNP's goal of ensuring inclusive and equitable education for all students by increasing the supply of qualified teachers through intentional teacher training aligns with our goals for providing a more sustainable future in the field of education.

Conflict of Interest

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

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Integrating Generative AI into Pedagogy: A Catalyst for Transformative Learning in Higher Education

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Abstract

This journal article explores the transformative potential of integrating generative AI into pedagogy, aligning with Mezirow's themes of Transformative Learning. The discussed headings encompass the manifold ways in which generative AI can revolutionize university education: Personalized Learning Experiences, Immediate Targeted Feedback, Interactive and Experiential Learning Activities, Support for Research Design and Development, Development and Enhancement of Critical Thinking Skills, and the Empowerment of Students. A conceptual framework diagram illustrates the intricate interconnectedness between Transformative Learning and the catalytic role of generative AI. Addressing ethical concerns and upholding academic integrity, the article emphasizes the importance of effective educational AI usage policies and the need to educate students about the ethical, efficient, and transparent use of AI. By fostering responsible AI practices, the integration of generative AI aligns with the principles of academic integrity and ethical considerations. In conclusion, this article asserts that generative AI has the potential to act as a catalyst for Transformative Learning in higher education. It calls for further research to provide empirical evidence supporting this transformative role, paving the way for a clear understanding of how generative AI can reshape the landscape of learning experiences for university students.

Keywords: Generative Artificial Intelligence (GenAI), Transformative Learning (TL), Students, Higher Education, Critical Reflection, Mezirow

Integrating Generative AI into Pedagogy: A Catalyst for Transformative Learning in Higher Education

Introduction

In today's rapidly evolving technological landscape, artificial intelligence (AI) is constantly pushing limits and transforming various industries and of particular interest in education is Generative AI (GenAI). Traditional AI functions within predefined rules, whereas GenAI possesses the capacity to autonomously learn from data and create original content, including text, artwork, code, and other forms of output. GenAI is a natural language processing (NLP) artificial intelligence (AI) system, a machine-learning system that uses algorithms to access its data set, make predictions about how to string words together, and put one word in front of another based on statistical probability, much like an enhanced predictive text. Since its launch in November 2022, ChatGPT has caused a furore across many areas of education, OpenAI released GPT-4, an advanced version of the original GPT-3 model, offering improved performance and capabilities, and DALL-E 2 which generates images from textual descriptions, enhancing creative workflows. Microsoft’s integration of generative AI into its Bing search engine provides enhanced search capabilities and conversational interactions. Google has developed Bard, a conversational AI designed to compete with ChatGPT, and integrated into various Google services like Docs and Gmail, and Vertex AI, a suite of generative AI tools for cloud services, including Vertex AI and Generative AI App Builder. Claude, created by Anthropic, is another conversational AI model, MidJourney is an AI tool for generating high-quality images based on text prompts, and Stable Diffusion

is an open-source image generation model. These platforms and apps have significantly expanded the capabilities and applications of generative AI, making it more accessible and useful across various domains.

The initial response favoured banning generative AI and finding other ways of preventing students from using GenAI to cheat or plagiarise, which highlights the very real ethical considerations and concern about maintaining academic integrity in the light of GenAI use. Many Higher Education Institutions (HEIs) around the world have now introduced policies for the ethical and transparent use of AI and this essay will consider the issues related to academic integrity if HEIs are to integrate GenAI into pedagogy. It is important that university students are educated about the effective, efficient and transparent use of ChatGPT and other generative AI and if educators integrate AI into pedagogy and actively encourage its use for teaching and learning, generative AI can have a transformational impact on education.

Generative Artificial Intelligence

A well-known example of generative artificial intelligence (GenAI) is ChatGPT. The acronym "GPT" in ChatGPT stands for Generative Pre-trained Transformer, a natural language processing (NLP) artificial intelligence (AI) system, a machine-learning system trained on more than 175 million parameters of text from the internet, including books, articles, and websites (Bessette, 2023). ChatGPT is a large language model (LLM) that uses machine learning algorithms to analyse this data and learn the patterns and characteristics of how words and phrases relate to each other to enable it to process and generate new content (Fitzpatrick et al., 2023). Using these algorithms, GenAI will access its data set, make predictions about how to string words together, and put one word in front of another based on statistical probability, like an enhanced predictive text, or the autocomplete function of a search engine (Floridi, 2023). GenAI can be regarded as participating in a rudimentary conversation with the user because of the way it will locate information and attempt to answer a question replicating natural language in coherent and contextually appropriate responses, replying to prompts in a conversational way (Rospigliosi, 2023).

Transformative Learning

Transformative Learning (TL) is an approach to adult teaching based on promoting change, whereby educators challenge students to critically question and assess the validity of the assumptions they hold about their relation to the world around them (Mezirow, 1997). This requires a learner-centred approach to teaching whereby the teacher acts as facilitator, guiding and supporting students, providing feedback, and answering questions when needed. Students take responsibility for their own learning, which helps development of a deeper understanding of the material and allows students to become autonomous.

Mezirow's TL is based on three main themes (see Figure 1):

- Experience of Life: This refers to the experiences that shape an individual's worldview. These experiences can be anything from personal events to academic learnings.
- Critical Reflection: This involves questioning one's own beliefs, assumptions, and perspectives. It is through this process of critical reflection that individuals often develop the ability to reflect on things that they may have taken for granted or were not quite aware of in the past.
- Rational Discourse: This is the dialogue that occurs when people face a "disorienting dilemma," which are experiences that do not fit into a person's current beliefs about the world. When faced with a disorienting dilemma, people are forced to reconsider their beliefs in a way that will fit this new experience into the rest of their worldview.

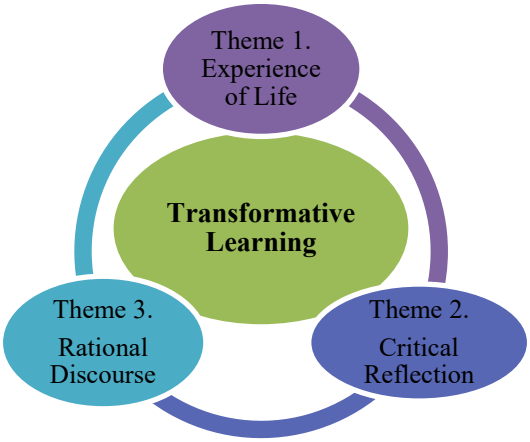

Figure 1: Framework depicting Generative AI as a Catalyst for Transformational Learning

Higher Education Institutions are often the context for students to experience disorienting dilemmas when they are confronted with new ideas and different points of view. This provides the ideal opportunity for Transformative Learning to take place and university educators who want to utilise this can provide opportunities for university students to engage in critical thinking; relate to others also going through the transformative process; and act on a new perspective (Kegan, 2009).

GenAI and Transformative Learning

Generative AI can act as a catalyst for this transformational learning by providing personalised learning experiences that are tailored to each student's individual needs and providing students with immediate targeted feedback on their work; creating interactive and experiential learning activities that encourage students to challenge their assumptions and promotes critical reflection; developing critical thinking skills by providing students with opportunities to question assumptions and analyse information and enhance these skills by providing students with new tools and resources to support their learning (see Table 1). GenAI can support research design and development and empower students to take control of their learning by offering choices, setting goals, and guiding them in self-directed exploration.

Table 1: Application of Generative AI in relation to the themes of Transformative Learning

Providing personalised learning experiences	**Providing immediate targeted feedback**	**Creating interactive and experiential learning activities**	**Supporting research design and development**	**Developing and enhancing critical thinking skills**	**Empowering students**
Perception of education as meeting their needs (Theme 2)	Critical reflection and self-examination (Theme 2)	Increase student engagement and facilitate group activities (Theme 3)	Development of research skills by providing students with information and resources on a particular topic (Theme 1)	Question assumptions, analyse information (Theme 2)	Challenge and clarify information (Theme 2)
Increase student engagement and collaboration (Theme 3)	Confront and revise beliefs, perspectives, and attitudes (Theme 2)	Analyse and synthesize information in innovative ways (Theme 1)	Increase confidence and productivity (All)	Engage in thoughtful inquiry (Theme 1)	Encouraging integration with existing knowledge (Theme 1)
Facilitate a deeper understanding	Develop metacognitive skills of	Enhanced problem-solving and	Inspire discussion (Theme 3)	Question pre-existing beliefs and	Promoting a deeper understanding of

Providing personalised learning experiences	Providing immediate targeted feedback	Creating interactive and experiential learning activities	Supporting research design and development	Developing and enhancing critical thinking skills	Empowering students
of the content (Theme 1)	thinking about one's own thinking and learning processes (Theme 2)	logical reasoning skills (All)		assumptions (Theme 2)	multiple meanings and concepts (All)
Acknowledging individual experience (Theme 1)	Diverse needs and experience acknowledged (Theme 1)	Encouraging discussion and dialogue (Theme 3)	Changes in perspectives, beliefs, and behaviours (Theme 3)	Creates opportunities for critical thinking (Theme 2)	Prepared with arguments and counterarguments for debates (Theme 3)
Engage in dialogue with GenAI (Theme 3)	Increased student engagement (Theme 1)	Students are empowered to assess their own learning (All)	Prompts critical reflection (Theme 2)	Need to be critical of the GenAI-generated responses (Theme 2)	Reflect on the responses generated (Theme 2)
Reflect on own interactions with GenAI (Theme 2)	Frequent and repeated testing and retrieval of knowledge help students retain information in the long term (Theme 1)	Develop approaches to addressing problems and promote independent thinking (Theme 1)	Encourage students to carry out scholarly research (All)		Encourages self-directed learning (Theme 1)
Unique learning preferences, abilities, and needs of individual students met (Theme 1)	Adaptability of GenAI promotes mastery learning (All)	Reflect on the implications of immersive experience (Theme 2)	Challenge perspectives, beliefs, and behaviours (Theme 2)		Improved understanding following multiple examples (Theme 1)
Ensures consistent challenge without being overwhelming (Theme 1)	Students adjust own strategies (Theme 1)	Challenge assumptions (Theme 2)	Enhanced quality of academic writing (Theme 1)		
Constant availability as most convenient (Theme 1)	Students confront and revise existing beliefs (Theme 2)	Engage in critical inquiry (Theme 3)			
Ask multiple and numerous questions (Theme 2)	Increased self-awareness (Theme 1) results in self-reflection (Theme 2)	Foster reflective dialogues (Theme 2) & (Theme 3)			

This article will explore each of these potential opportunities for GenAI to have a transformational impact on learning and will demonstrate how the integration of GenAI into pedagogy can act as a catalyst for Transformative Learning (TL) experiences among university students to be more self-motivated, self-governing, rational, collaborative, and empathetic. The article will consider the ethical considerations around the integration of GenAI and the associated concerns about academic integrity and will identify areas for further research and development before concluding that now is the time to embrace the education revolution that is generative AI.

Generative AI as a Catalyst for Transformative Learning

Provide Personalised Learning Experiences

Personalized learning connects the student's previous knowledge, experience, and abilities, with training materials that link that understanding to new information (Edula et al., 2023; Raashika et al, 2023). An opportunity to provide personalised and effective learning experiences is offered by GenAI to meet the unique learning preferences, abilities, and needs of individual students (Kasneci et al., 2023; Ray, 2023; Su and Yang, 2023). ChatGPT can collect and analyse individual student's learning patterns, preferences, and strengths to customise learning and enable students to focus on the subject matter and critical thinking (Javaid et al., 2023). For example: An AI-driven language app tailors vocabulary and grammar exercises to a student's proficiency level, adapting to each individual learner's needs and pace of progression (Chang & Kidman, 2023). This ability to provide personalised content on demand marks a significant shift from a 'one-size-fits-all' approach to a bespoke 'tailored-fit' method of teaching and learning (Weisz et al., 2023). This tailored approach offers an immersive and efficient learning experience (Baskara, 2023) that can ensure learners are consistently challenged without becoming overwhelmed. This learning experience facilitates a transformative shift in students' perception of education as a dynamic, adaptable process that meets their needs.

This proposed opportunity provided by GenAI highlights a reconceptualization of the role of educators from didactic distributors of knowledge to being facilitators of learning who can focus more on supporting students and their holistic development (Kim et al., 2022; Qadir, 2023; Queiroz et al., 2022). GenAI-powered tutoring systems can further supplement the work of teachers by offering online tutor assistance to students, answering questions, providing explanations, and guiding them through problems (Ray, 2023). This tutoring support is available constantly and so can be offered at a time most convenient for the student, in addition, students can ask multiple and numerous questions without the GAI becoming tired (Singer, 2023). This ability to provide a platform for asynchronous communication has been found to increase student engagement and collaboration, as it allows students to post questions and discuss topics without having to be present at the same time (Li & Xing, 2021).

As part of the personalised learning experience, GenAI produces accurate and meaningful conversations that are realistic and engaging (Deng and Lin, 2022). This enables students to enter into an actual discussion, enquiring about aspects of the response they have received that they are not fully comprehending of and so engaging in the turn-taking strategy of dialogue (Schäfer, 2023), one of the core elements of TL. Mezirow (1997) argues that students must participate effectively in discourse to facilitate transformative learning (p. 7). Students can also reflect on their interactions with GenAI, considering the quality of the information they have received, the effectiveness of their inquiries, and the process of critical evaluation. This reflective practice aligns with Transformative Learning's focus on self-awareness and ongoing self-reflection.

The provision of these tailored learning experiences based on individual students' needs, strengths, and preferences aligns with Mezirow's emphasis on the importance of individual experience in transformative learning (Calleja, 2014). By providing learning materials that resonate with the student's experiences and interests, GenAI can enhance the student's engagement and facilitate a deeper understanding of the content. This in turn empowers students to take ownership of their education, following TL's principle of autonomous and self-directed growth (see Table 1 above).

Provide Immediate Targeted Feedback

Educational feedback has been widely acknowledged as an effective approach to improving student learning (Dai et al., 2023). ChatGPT is capable of providing students with immediate detailed feedback on their work that has high agreement with the instructor and offering recommendations for development and task completion (Dai, et al., 2023; Javaid et al., 2023). During lessons, class participation is often encouraged, however, many students are reluctant to engage fully because of concern about judgment from their peers. Constructive feedback provided by GenAI in privacy and without class participation does not cause the same self-consciousness, so students may be more willing

to engage, take risks and be vulnerable (Chen, 2023). This self-paced learning and real-time feedback enables students to identify and correct mistakes promptly, which in turn benefits students developing learning skills and accelerates the learning process (Sok & Heng, 2024). AI-generated feedback on student work can be a powerful tool to facilitate the process of students' changing their beliefs, perspectives, and attitudes through critical reflection and self-examination required by TL. In addition, AI-generated feedback can help students develop the metacognitive skills of thinking about one's own thinking and learning processes, a key component of transformative learning.

GenAI can provide further support for transforming learning by creating adaptive assessments rather than simply providing feedback on work submitted and can be used as an interactive study guide that can generate practice exams and provide immediate feedback (Meyer et al., 2023). Low-stakes frequent tests are an effective teaching strategy across educational levels and settings and repeated testing and retrieval of knowledge help students retain information in the long term (Mollick & Mollick, 2023). GenAI-powered assessments can adapt in real-time based on a student's responses, providing immediate feedback and adjusting the difficulty level to match the student's abilities, promoting mastery learning and reducing frustration (Cotton et al., 2023).

This personalised approach recognises TL's core element of acknowledging students' diverse needs and experiences, creating a more inclusive learning environment. Based on the feedback provided, students can analyse their work, explore alternative ways of approaching the problem, and adjust their strategies as appropriate, following TL's requirement to confront and revise one's existing beliefs. As a result, students become more aware of their learning process, strengths, and areas requiring improvement, and this increased self-awareness encourages them to reflect on their learning strategies, aligning with Transformative Learning's focus on self-reflection and self-awareness (see Table 1 above).

Create Interactive and Experiential Learning Activities

Educators can use GenAI models like ChatGPT to create a range of stimulating activities that can increase student engagement (Sok & Heng, 2024). By presenting students with complex problems and scenarios that require critical thinking, problem-solving, and decision-making, GenAI can increase student engagement and facilitate group activities (Meyer et al., 2023). Engaging with these scenarios encourages transformative growth by challenging students to analyse and synthesize information in innovative ways. For example: Educators can allocate students to work in teams and carry out research using ChatGPT during the lesson by entering prompts and follow-up queries appropriate to the generated responses, the groups then present their findings to their peers (Sabzalieva & Valentini, 2023). This collaborative learning approach allows students to lead class activities whilst teachers facilitate the discussion, thereby enhancing the students' problem-solving and logical reasoning skills as well as encouraging discussion and dialogue to foster TL. Transformative learning is further encouraged because students are empowered to assess their own learning and develop their approaches to addressing problems (Rudolph et al., 2023).

Interactive GenAI-powered content can captivate students by simulating real-world scenarios, virtual labs, and dynamic visualisations, making learning more engaging and enhancing understanding. GenAI-driven simulations can also facilitate "what if" scenarios that encourage students to explore hypothetical situations and observe the outcomes. This transformative learning experience prompts students to consider various possibilities, encouraging critical thinking and complex decision-making. For example: Qadir (2023) points out that engineering education is significantly enhanced by ChatGPT creating realistic virtual simulations for hands-on learning. This direct involvement encourages transformative insights and connections between theoretical knowledge and practical applications. Experiential learning also emphasises learning by doing and engaging with real-world contexts, which fosters TL by encouraging students to immerse themselves in GAI-mediated experiences and reflect on their implications. Interactive and experiential learning activities can encourage students to challenge assumptions, engage in critical inquiry, foster reflective dialogues, and promote independent thinking, all of which aligns with TL principles and allows students to undergo transformative shifts in their cognitive processes (see Table 1 above).

Support for Research Design and Development

Research design is complex and GenAI is able to support this process by streamlining research elements and pinpointing relevant results, generating ideas for research topics, and summarizing lengthy texts (Cox & Tzoc, 2023; Rahman et al., 2023), as well as by outlining articles and generating references (Khan et al., 2023). Students can find resources and supporting materials with ease because GenAI can recommend books and articles relevant to the topics or projects that students are working on (Cooper, 2023; Fauzi et al., 2023). GenAI can also assist in the development of research skills by providing students with information and resources on a particular topic, clarifying current research topics and making suggestions about unexplored aspects of the topics being covered (Kasneci et al., 2023). This assistance in research design and development means that GenAI can enhance flexibility, increase consistency and improve the speed of student researchers as well as reinforcing objectivity (Alshater, 2022). As such, the integration of GenAI could encourage students to carry out scholarly research and to do so with more confidence and productivity (Sok & Heng, 2024), in turn increasing their experience of transformative learning by inspiring discussion and reflective practice. The support offered by GenAI in research design and development fosters a culture of inquiry and critical thinking among learners, in line with Mezirow's emphasis on rational discourse and critical reflection as key components of transformative learning (Calleja, 2014).

In addition to this support for research design and development, GenAI can enhance the quality of academic writing when used as a writing and editing tool rather than for prompt-based text generation, which can provide further benefits to students in their research endeavours, especially for non-native English speakers (Meyer et al., 2023). This assistance can support students with confidence in their own ability and encourage completion of the tasks at hand (Sok & Heng, 2024), which in turn promotes TL by fostering deep, transformative changes in their perspectives, beliefs, and behaviours (see Table 1 above).

Develop and Enhance Critical Thinking Skills

GenAI can create opportunities for critical thinking through providing content that introduces new ideas and by generating multiple explanations from a variety of perspectives and different viewpoints. GenAI can use a step-by-step approach and add details to any existing explanations, which it can then adapt to be a simpler summary or build on the complexity of the explanations and examples provided (Fido & Wallace, 2023; Mollick & Mollick, 2023). This can facilitate the development of critical thinking skills among students by providing them with opportunities to question assumptions, analyse information, and engage in thoughtful inquiry. This follows the TL core elements of encouraging students to challenge their existing beliefs, consider multiple perspectives, and undergo shifts in their understanding and worldview. To facilitate transformative learning, students must become aware and critical of their own and others' assumptions (Mezirow, 1997).

Critical thinking skills will be further enhanced because GenAI is not able to assess the value or accuracy of the information it provides, and so students will need to be critical of the GenAI-generated responses and content (Dobrin, 2023). All of these opportunities to develop and enhance critical thinking align with the principles of TL (see Table 1 above), as Mezirow claims that transformative learning is a route to the development of critical thinking (Mezirow, 1997). By challenging learners to question their assumptions and engage in rational discourse, GenAI can facilitate transformative learning (Calleja, 2014). In addition, enhancing creativity and critical thinking skills can help prepare university students to thrive in an uncertain future and changing economy.

Promote Student Empowerment

GenAI can empower students to take control of their learning by offering choices, setting goals, and guiding them in self-directed exploration. The conversation with GenAI is initiated and controlled by the student, which empowers the students as they are not passive recipients of notifications or tasks (Dai et al., 2023). Successful conversations are reliant on student input, in line with student-centred learning and encouraging the students to take ownership of their own learning, playing a key role in planning,

organising and indeed personalising their own learning journey (Lee & Hannafin, 2016), thereby aligning with TL principle of self-directed learning and autonomy (see Table 1 above).

GenAI can generate summaries and outlines of texts, helping students to quickly understand the main points of a text and to organise their thoughts for writing (Kasneci et al., 2023). Students can challenge and clarify information by asking GenAI to respond to follow-up questions, encouraging integration with existing knowledge and promoting a deeper understanding of multiple meanings and concepts (Rospigliosi, 2023). Students better understand complicated concepts when provided with many and varied examples because they can decontextualize the idea from the example, leading to better recall and understanding (Mollick & Mollick, 2023). GenAI is capable of providing numerous examples and thereby helping students move knowledge from surface to deep learning. To facilitate transformative learning, students need practice in recognizing frames of reference and using their imaginations to redefine problems from a different perspective (Mezirow, 1997, p. 7).

Integration of GenAI into pedagogy may result in students no longer requiring mastery of proficiency in basic skills, but will raise the expectation, for example students will be required to edit and curate information, question the validity of the results, and so be forced to engage deeper than they have previously (Chen, 2023). Furthermore, students' writing abilities may be enhanced by using text completion, translation, and text summarising tools (Javaid et al., 2023). GenAI can inspire creativity by assisting students in generating ideas, prompts, and even co-authoring stories or essays, which can be particularly useful in language arts and creative writing classes (Ray, 2023; Su and Yang, 2023). GenAI can produce plausible arguments and counterarguments on a particular subject to help prepare students for debates (Javaid et al., 2023), which involves students in active dialogue and so facilitates TL. Students can reflect on the responses generated and ask follow-up questions, which promotes learning autonomy and improves critical thinking skills (Sok & Heng, 2024), requisites for TL to effectively transpire. Engaging GenAI in this way encourages self-directed learning whereby students take control of their learning journey, seeking information and guidance as needed - a transformative shift towards autonomy and metacognition (see Table 1 above).

The interconnectedness of the three themes of Mezirow's Transformational Learning along with the various ways in which generative AI can act as a catalyst for transformative learning have been described in this article and are illustrated in the framework below (Figure 1 and Table 1, both above). Figure 1 highlights the three themes of Transformative Learning: experience of life, critical reflection, and rational discourse and Table 1 depicts GenAI's role in providing personalized learning experiences, immediate targeted feedback, creating interactive and experiential learning activities, supporting research design and development, and developing/enhancing critical thinking skills in relation to each of these themes. The overarching framework emphasizes the transformative nature of learning and the facilitating role of generative AI within this context.

Ethical Considerations and Academic Integrity

The potential of GenAI to assist university students is multifaceted and varied, but there are concerns about academic integrity such as plagiarism and cheating (Foltynek et al., 2023; Lambert & Stevens, 2023; Stokel-Walker, 2022), for example if students use AI generated text or essays unaltered as their own work. This challenge is heightened by the fact that it can be hard to detect generative text using traditional anti-plagiarism software because GenAI generates a brand-new answer for questions asked (Eke, 2023). There are also currently no requirements of transparency or that the work generated is watermarked or tagged as synthetic, and this can be further problematic for university educators who may not recognise work as AI generated. In addition, although there are GenAI detectors and plagiarism checking software available, it is difficult to determine when a written submission has been created by generative AI because rather than relying on copying and pasting from existing sources, GenAI generates a brand-new response every time a prompt request is entered and this could lead to ethical concerns about the use of machine-generated content (Fitzpatrick et al., 2023).

The response to these academic integrity concerns and ethical challenges is two-fold, firstly educational institutions must ensure that they have clear policies and guidance on GenAI use that provide

a framework specifying the acceptable and unacceptable uses of AI tools as well as the protocols for reporting AI usage in a transparent and accountable manner; and secondly, students must be trained and offered guidance on effective interactions with GenAI (Pham et al., 2023). University students should clearly attribute the AI's contribution in their work when they use AI tools to generate content, including specifying the AI model used, the dataset, and any parameters or modifications applied. Students should be taught how to cite AI-generated content appropriately to maintain transparency and give credit where it is due. Students might not be aware of the ethical issues associated with incorporating AI into academic endeavours, so it is the role of the university educator to educate students about these issues and the importance of maintaining academic integrity, to understand why it is important to produce original work, give credit to sources, and follow ethical guidelines in academic pursuits. Educators should teach students on the responsible utilisation of AI tools, emphasizing that AI should serve as an additional resource to enrich their learning, rather than a shortcut to academic achievement. When students have a complete understanding of the significance of academic integrity, the likelihood of them breaching the set expectations diminishes. and if they are offered a choice in how they learn and how they are assessed, this too could reduce academic misconduct in general (Kumar et al., 2023; Perkins et al., 2020).

Recommendations

The relatively recent and very rapid arrival of GenAI in educational settings means that there is limited research and literature available on student perceptions of the use of GenAI and its effectiveness with regard to impacting on and transforming learning. Studies have found that students generally have a positive perception of using GenAI in education (Chan & Lee, 2023; Limna et al. 2023; Malik et al., 2023). Limna et al. (2023) state that students find it a helpful tool for providing immediate feedback, answering questions, and providing support and Chan and Lee (2023) found that students perceived enhanced productivity, efficiency, and personalized learning, and expressed intentions to use GenAI for various educational purposes. According to research carried out by Malik et al. (2023), students acknowledged the benefits of GenAI in grammar checks, plagiarism detection, language translation, and essay outlines. The potential for GenAI to transform the learning of university students means that there is a need for further research into student perceptions of GenAI, and its effectiveness as well as student use and the efficacy of GenAI to successfully act as a catalyst for transformative learning in support of the proposals put forward in this article.

Conclusion

Integrating GenAI into pedagogy can foster TL by creating dynamic, personalized, and interactive learning experiences that challenge assumptions, encourage critical thinking, and promote self-directed growth. By leveraging the capabilities of generative AI, education can shift from a one-size-fits-all approach to a dynamic, adaptive, and learner-centred model that empowers students to reach their full potential.

Considering the rapidity with which AI has infiltrated our daily lives, the integration of GenAI into pedagogy will encourage students to embrace technology as a tool for empowerment, becoming adaptable to technological advancements, a transformative process that prepares them for the evolving information landscape. Mezirow suggested that transformational learning produces more extensive behaviour change in the person and has a more considerable impact than other kinds of learning. He argued that the combination of reflection and discourse encourages the learner to transform their views, which in turn makes them more inclusive and compassionate of others (Mezirow, 2009). These surely are skills necessary for the citizens of the Twenty-first Century and for future employment, whatever that might look like.

This article has considered some of the ways in which GenAI can be integrated into pedagogy to provide opportunities for transformational learning experiences for university students. The need for further research to collect data and results with regard to the effectiveness of student learning with the use of GenAI has been highlighted by the considerations provided in this paper. In conclusion, GenAI integration promotes a culture of lifelong learning in which students understand that education is an

ongoing process of growth and transformation, aligning with the core principles of Transformational Learning and preparing the students of today to become lifelong learners.

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Becoming a professional: Interdisciplinary courses as sites for transforming professional identity

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Abstract

This paper highlights how interdisciplinary courses can transform professional identity and foster cross-disciplinary collaboration, using the lens of Wenger's "communities of practice." We analyzed interviews, class sessions, and journal entries from two courses: an arts education course that brought together theatre and education students and a child development course for psychology and education students. In each course, students experienced legitimate peripheral participation through hands-on, collaborative field work, and found themselves positioned as central participants in their discipline relative to students from another discipline. Analysis revealed that students embraced and clarified their professional identities and gained increased efficacy for cross-disciplinary collaboration.

Keywords: Interdisciplinary Course, Professional Identity, Community of Practice, College Students, Teacher Education, Active Learning

Becoming a professional: Interdisciplinary courses as sites for transforming professional identity

Introduction

Interdisciplinary learning in college coursework is widely lauded. Scholars recognize a range of affordances provided by interdisciplinary courses, including the potential to develop higher-order thinking skills; to foster understanding from multiple perspectives; to allow students to integrate multiple areas of interest; and to provide a more holistic learning experience (Bear & Skorton, 2019; Jones, 2010; Vink et al., 2017). Although less often mentioned in the literature, another benefit of interdisciplinary courses derives from such courses' potential to bring students with different disciplinary backgrounds and/or differing professional aspirations into robust interaction with each other. When this happens, students have the opportunity to gain greater understanding of their own future professions as well as those of their peers, a feature that is especially useful to college educators who prepare students for specific professions (Arce-Trigatti et al., 2019; Crans & Rovetti, 2011; Kavanaugh & Cokley, 2011; Singer et al., 2015; Stone, 2008). Such courses may also develop students' dispositions toward cross-field collaboration (Arce-Trigatti et a., 2019; Cusack et al., 2012; Van Winkle et al., 2012). Most importantly, when designed well, courses in which students collaborate with those from other majors may also promote the development of their professional identities as members of their aspirant fields (Cusack et al., 2012).

Indeed, the development of professional identity is recognized as an important goal for college students across disciplines because it serves as the lens through which professional meaning-making and decision-making occur (Hardy & Chapman, 2022; Jackson, 2017; O'Brien & Bates, 2015; Ryan & Carmichael, 2015; Tsybulsy & Muchnik-Rozanov, 2019). Our study, therefore, examines professional identity development in two interdisciplinary college courses designed to serve students from two or more majors, including an arts education methods course for theatre and education students and a child

development course for education and psychology majors. We argue that such courses have the potential to be transformative for students because they create opportunities for students to inhabit identities within their chosen professional community. Further, students come to understand themselves as boundary-crossers, able to collaborate effectively across disciplines.

Literature Review

Interdisciplinary Courses and Professional Identity

Research on interdisciplinary college courses has primarily focused on specific content or skill outcomes, but some studies have addressed students' professional identity development, perception of other disciplines or professions, and/or willingness to collaborate across disciples. For example, Cusack et al. (2012) found that health science students who participated in an interprofessional, problem-based learning module showed increases in positive professional identity. These authors suggest that this is the result of working in small interprofessional groups, where students' unique roles within a healthcare team became more salient. Cusack et al. explain their findings in terms of self-determination theory: the program was student-centered, offering experiences of autonomy and competence, which strengthened their sense of themselves in the professional role they held during the project.

Singer et al. (2015) found that an interdisciplinary course on irrigation engineering deepened understanding of the multi-faceted nature of engineering as a field among both engineering and non-engineering students. Similarly, Stone et al. (2008) documented how a course for journalism students and social work students fostered increased understanding of both professions. Arce-Trigatti et. al (2019) found that nursing and chemical engineering students in a clinical immersion course developed specific cross-disciplinary communication strategies that ultimately led to a deepened respect for each other's profession. Lam (2005) found that bringing together students from education, social work, psychology, and counseling resulted in reduced stereotyping and increased interprofessional understanding. Likewise, studies by Crans and Rovetti (2011) and Kavanaugh and Cokley (2011) describe how courses that combine students from two different disciplines broke down stereotypes about particular majors and generated greater appreciation for the other discipline. Lindqvist et al. (2005) found that students working in interdisciplinary groups developed more positive attitudes toward diverse health professions than students in single-discipline health education. Van Winkle et al. (2012) found that an interdisciplinary course for medical and pharmacy students improved attitudes about professional collaboration, which was also a finding in Cusack et al. (2012) and Arce-Trigatti et. al (2019).

On the other hand, not all researchers report positive outcomes, especially about developing appreciation for another discipline or increasing disposition toward interprofessional collaboration. Rienties and Héliot (2018) found that requiring students to work in cross-disciplinary groups in an interdisciplinary organizational behavior course was not enough to bring about a meaningful exchange of ideas among students from different disciplines. In Lewitt, et al. (2010), pre-existing stereotypes between pre-medical and biomedical students interfered with both groups' abilities to benefit from interprofessional learning. Dickey (2010), who brought together computer science and arts students for a game design course, found feelings of resentment between the two groups regarding decisions they made about their projects, along with underlying misunderstandings about each other's disciplines. Dickey describes how each group "contested for power" (p. 168) as a result of their enculturation into different disciplines with differing values and practices.

The studies reporting problematic findings differ in important ways from those documenting more desirable outcomes. In the research reported above, the courses that yielded enhanced professional identity, greater appreciation for other disciplines or professions, or increased interest in cross-disciplinary collaboration all engaged students in collaborative, authentic problem solving, using either problem-based-learning or a case-studies approach. By contrast, Rienties and Héliot (2018) examined outcomes from interdisciplinary groups charged with studying course material rather than collaborating on a project or problem. Lewitt et al. (2010) engaged students in problem solving but in a way that was inauthentic to both groups in the study (a problem that study participants pointed out). In Dickey's

(2010) study, students from differing disciplines worked independently, having been given separate tasks within a larger group project.

In sum, prior research suggests that a course that brings together students with divergent professional aspirations has the potential to foster enhanced professional identity, professional understanding, and disposition toward collaboration, especially if it includes authentic collaborative problem-solving. However, disciplinary differences and pre-existing stereotypes may serve as barriers.

Interdisciplinary Courses and "Legitimate Peripheral Participation"

Our study highlights the transformative potential of interdisciplinary courses by taking a deeper look at how such courses provide opportunities for students to inhabit their hoped-for professional identity and to experience themselves as effective cross-disciplinary collaborators. Wenger's (1998) theory of "communities of practice" offers insight into how and why interdisciplinary courses have the potential to generate highly personal, and highly transformative, forms of learning. Building on ideas he initially developed with Lave (Lave & Wenger, 1991), Wenger proposes a theory of learning as not just the acquisition of information or skills but as a socially-situated process of "becoming a certain person" (2010, p. 2). Wenger observes that most human activity is situated within communities of practice, which are groups of people bound together by mutual engagement in a shared endeavor, for example those who share a craft or a profession. Learning is conceptualized as a trajectory from newcomer to central participant (or "oldtimer") in the activities of a community of practice. As one travels this trajectory, the community, its practices, and one's relationship to both of these increasingly become part of one's identity. Wenger asserts that learning is the ongoing "production of identity," (2010, p. 2), as one's changing position within a community continuously modulates one's experience of oneself. Wenger further notes that we all participate in many different communities at any given time and that our identities reflect our experiences of this "multimembership" (Wenger, 2010, p. 6).

In order for newcomers to learn the practices of a community, the community provides opportunities for "legitimate peripheral participation," in which newer members engage in simpler tasks that require less expertise but are nonetheless productive or valuable to the community's enterprise. Legitimate peripheral participation allows newcomers to gain facility with a community's repertoire of activities, terminology, and organizing principles.

College students are often newcomers in their disciplinary communities when compared to their professors or to practicing professionals, and college courses often serve as sources of legitimate peripheral participation for disciplinary practices, especially when they engage students in the authentic practices and problems of the field. At the same time, in an interdisciplinary college course, students who have prior experience in a discipline are positioned as more "central" participants relative to their peers who have no such experience. This experience as a more central participant may serve to strengthen students' identification with their chosen disciplines (Wenger, 2010). In our study, we examine courses that engaged students in legitimate peripheral participation in both a familiar discipline and a new one. We are interested in the ways these courses allow student to inhabit their professional identities and in the ways such courses invite students to revise their identities to include the new discipline, which in turn may allow them to explicitly understand themselves as "multimembers" who can productively engage with multiple disciplines.

Communities of practice and transformative learning

In an effort to characterize the relationship between Wenger's (1998) communities-of-practice theory and Mezirow's (2000) theory of transformative learning, Hodge (2014) proposes the concept of a "transformative trajectory" (p. 174) as a common element in both theories. As Hodge points out, Mezirow's phases of transformative learning can be understood as a journey out of one set of social practices, including practices via which one makes meaning and understands one's self, into another. He notes that this aligns with Wenger's description of identity changes that come about as learners move from the periphery of a community toward its center or move between differing communities. While Hodge acknowledges important discontinuities between Wenger and Mezirow, he emphasizes that the

two theories are complementary, and that taken together they allow us to understand that transformative learning is necessarily an "inter-practice" phenomenon (p. 167).

Hodge (2014) further explains that the "transformative trajectory" is driven, in both theories, by incompatibilities between prior understandings or practices and those the learner is newly taking on. He also notes that in many educational situations, learners are moving from the lay-person's utilization of "large scale practices," or generalized ways of making meaning in a given domain as practiced in the society-at-large (p. 176-177), toward employment of the more specific and considered understandings/practices of a professional community. So, for example, if the aim of an educational endeavor is for students to adopt professional identities within their disciplines, as it is in the professional education literature cited above, the "incompatibility" that drives learning will be between lay theories and disciplinary knowledge. Further, learners successfully engaging in their first authentic or "legitimate" professional activities may experience incompatibility between viewing oneself as a newcomer lacking competence and experiencing oneself as a capable practitioner. If the aim is for students to become effective and willing cross-disciplinary collaborators, the driving incompatibility is one between feeling siloed within one's primary discipline and experiencing efficacy in collaboration across disciplines. In our study, we follow Hodge in understanding that students' movements toward the center of a community of practice and their shift to being "multimembers" are forms of transformative learning in which students take on new understandings of themselves and embrace new identities.

Methods

Data

Our data is drawn from two upper-level undergraduate courses taught at a small liberal arts college in southeastern U.S.

- *Practicum in Arts Education* brought together theatre majors and education majors/minors including teacher licensure candidates and students interested in non-profit human services work. As a class, the students designed and implemented a creative dramatics course for children at a local non-profit. The disciplinary homes of the eleven course participants are listed in Appendix A.
- *Child Development in Context* brought together psychology majors and elementary education majors to work with teachers at a local elementary school in developing strategies to foster children's self-regulation. There were three education majors and three psychology majors in the course.

Our data includes field journals, transcripts of class sessions, and transcripts of interviews conducted mid-semester and after the course concluded. For the child development course, we also used students' on-line discussion board posts. Approval from the Human Subjects Review Committee at the first author's institution was secured before data collection began.

Analysis

Analysis proceeded using standard grounded theory technique (Glaser & Strauss, 1967) in which iterative passes were made through the data using *a priori* codes based on our initial research question, allowing as well for open (*in vivo)* coding when interesting, unanticipated themes occurred. Several constructed codes (codes that combine multiple *in vivo* codes into one larger group) emerged as we observed commonalities across *in vivo* codes. Initially, we were interested in understanding student experience in interdisciplinary courses in which one of the disciplines was education; we were especially interested in how majors' and non-majors' perceptions of education as an academic discipline evolved as a result of the experience. After several rounds of coding, we observed multiple occurrences of a code we called "effects of students from other majors in the course" and we became interested in whether interaction between students from differing majors had specific learning benefits. We turned to literature on interdisciplinary and interprofessional college courses to develop a new set of *a priori* codes, reported in Appendix B. We then made further iterative passes through the data, during which additional *in vivo*

codes emerged and evolved into new constructed codes. Once coding stabilized, we looked across the coded segments to identify patterns and themes related to our new research question: what effect, if any, does interacting with students from another major have on student learning in an interdisciplinary course?

Trustworthiness

The first author, Stacy DeZutter, holds advanced degrees in the learning sciences and theatre and was the instructor for both courses under study. The second author, Tara Johnston, now holds advanced degrees in elementary education and literacy and was an undergraduate student in the self-regulation course and a research assistant on the project at the time of the study. Our awareness that our positionality influenced our analysis led us to engage in member checks, in which several participants from each course reviewed the results reported here and verified that we had assembled an accurate representation of their experiences. We also attempted to find counter-examples to our conclusions, instances in the data in which participants described negative effects of any kind from interacting with students from another major. Apart from some instances of personal insecurity among the students early in the course, we did not find anything in the data that suggested that working with students from another major negatively impacted student experience or professional growth. We did find some examples of stereotyping specific disciplines, and those are reported below.

Findings

Legitimate Peripheral Participation: Engaging with Disciplinary Terms, Practices, and Values

Both courses engaged students in real-world problem solving at the intersection of two disciplines, providing opportunities for legitimate peripheral participation in a student's home discipline and in a newer one. We, therefore, were not surprised to observe that, as each course unfolded, students adopted the terminology and practices of their new disciplines as they taught each other the terminology and practices of their home discipline (Arce-Trigatti et al., 2019).

In the arts education course, participants taught a drama enrichment class which included teaching children games and exercises that actors use to hone performance skills. Implicit in these games are certain values and priorities of the theatre community, for example the idea that one should always be fully accepting of one's acting partner's contributions (the principle of "yes, and"). In teaching theatre games to their classmates and to the children, the theatre majors necessarily articulated such values. As the semester progressed, field journals and class session transcripts revealed that participants without prior theatre training began to use theatre terms such as "in the moment" and "actor's neutral" that represented the values and practices of the theatre community. At the same time, participants drew on the resources of the education community to address issues such as creating an effective learning environment and providing developmentally appropriate feedback. Consequently, the theatre majors began to employ strategies they observed among the education majors, such as clearly defining procedures for group work and giving specific, informative praise.

In the child development course, field journals and class session transcripts showed that the education majors became conversant in concepts from cognitive and developmental psychology, such as "emotion regulation," "inhibitory control," and "metacognition," since they were tasked with designing activities that foster the development of these capacities. At the same time, the psychology majors began to use terms they heard the education majors use, such as "classroom management" and "attention-grabber;" and to employ common teacher strategies, including a clapping pattern as a means for regaining a class's attention and several techniques from the "Whole Brain Teaching" method (https://wholebrainteaching.com/) that the education majors introduced.

"Becoming a Certain Person": Embracing professional identity by working alongside newcomers

The reciprocal teaching-learning relationship among the students in the course had two clear effects: it allowed students to actively embody identities within the home discipline and it enhanced efficacy for the new discipline. With great frequency, students pointed to instances in which they were

able to translate prior classroom learning in their home discipline into actual practice. For example, Charlotte, an education student in the arts education course, noted in her journal,

> This experience . . . helped me put into practice some of the things I had learned in [Classroom] Management [a previous education course], such as fixing problems before they become an issue, rather than trying to correct them afterwards.

Statements like this one, in which a student refers to actively employing specific ideas she had learned "academically" in a previous course, were plentiful. Students also found themselves speaking as representatives of their disciplines. For example, in discussing differences between her own teacher preparation and the approaches employed at the field site, Sandra offered this observation to her classmates on the child development discussion board:

> I find that it is common sense in the [college's] educational department that things like self-regulation, authoritative student and teacher relationships, differentiated learning, collaboration, parent involvement, and other "non-prescribed" teaching techniques are what make a classroom run.

With this comment, Sandra articulates some of the priorities within the community of practice she has been working in and directs her non-education-major classmates' attention to these practices as they, too, begin to participate in this community. In doing so, Sandra acts as a knowledgeable practitioner of her own discipline.

Participant comments document that they were well aware of the value classmates from another discipline provided to their efforts at their field sites. Near the start of the child development course, Kim, a psychology major, expressed excitement in her journal about working across the disciplines of psychology and education:

> I . . . think maybe since each student [in the course] has different experiences in working with children that maybe it will be a more interesting dialogue about some education topics than I have had the opportunity to participate in before.

A few weeks later, Kim reassured another psychology major on the discussion board by noting, "I think just being there and also learning from others . . . plus hearing other success stories/ideas from more education-focused people in our class will help [with challenges in classroom management]." Katherine, a psychology major in the child development course, described in her journal how working with an education major helped her gain confidence in an area she had been uncertain about.

> I've been wondering about what "classroom management" entails. . . . Today in class, as part of an activity, we had to talk about what classroom management means. I was paired with Sandra, and I told her that she was going to have to explain to me what it meant. She said, "Well, how about you tell me what it means to you." She is a great teacher. I have been feeling out of my element and she helped me engage with something that I am uncomfortable with. After I answered, she told me that I actually know what I'm talking about after all; the education world just has different words to describe it. It was really just a little thing, but it made me feel like I may have more to offer than I realize, despite my lack of education background.

In the arts education course, Maya, a theatre major noted in her journal, "Annie [an education major] is really good about explaining the games, which I think is excellent and very beneficial for me to watch and learn from." Also in that course, several students stated in their journals that they became more comfortable with their cross-disciplinary endeavors because they were partnered with a peer from the other discipline. For example, Annie explains, "I'm especially glad that [the instructor] assigned me to work with Lillian who has a background in theater. I think that will make me more comfortable, and I will be able to learn much from her." Similarly, Jane noted,

> Luckily, I have a great partner who loves theater and knows a lot about it as well. I think we'll be a great group, because I can practically talk to anyone and anything and I love kids, and she has done a lot of theater programs with kids.

Jane's teaching partner, Sarah, made the same observation at the end of the course:

> I was more familiar with the games and how to play them and what we were looking for in the games whereas Jane wasn't always as sure as to what we were actually supposed to be doing but she understood kids really well and especially the younger kids, because I didn't really understand young kids so she could deal with that and I could deal with the theatre stuff.

As Jane's and Sarah's comments suggest, awareness that students from another discipline have value to one's own efforts entails a concomitant awareness that one's own disciplinary background may be of value to others. Sandra explained in her journal how this worked in the child development class:

> I think Brooke and I together, since we have both been through the whole elementary education [program] have just more of the education aspect to offer, but I think in turn that the psych people have more developmental [understanding] to offer us.

In many cases, student comments reflected intentional sharing of one's disciplinary knowledge in order to assist classmates. For example, during a class discussion in which the arts education class was trying to decide how to manage a group of children who began doing handstands during an activity about character emotions, Molly proposed a technique she learned in a prior field experience at a preschool:

> . . . one thing that I learned that the teacher I worked with taught me about was like when a kid misbehaves—if all of them are doing, like the handstand thing, we kinda shifted the focus to that. So maybe for instance, if they were all doing handstands, you would say okay, so make an excited face while you're in a handstand, then calm down. Make a sad face . . .. maybe turn that [misbehavior] into something in the game that we're already doing.

As another example, Tessa, a psychology major, made the following contribution on the child development discussion board on whether or not to give children material rewards for good behavior.

> I ventured back to my social psychology textbook and flipped back to the chapter on "the self". Here it discusses intrinsic versus extrinsic motivation. To sum it up, there is no doubt that rewards are powerful motivators, but you have to consider the effects of rewards on people's thoughts about themselves, their self-concept, and their motivation to complete tasks in the future.

When the child development class was trying to address problems with feelings of excessive frustration among both teachers and children, psychology major Katherine offered, "I have experience in emotion regulation training…. I think that this may be a reasonable plan to implement in the future." Indeed, the class agreed that this would be valuable, and Katherine led a session on emotion regulation the following week.

When a student offers ideas to classmates based on her prior training in a discipline, it positions her as a relative expert, or, to use Wenger's terms, an "oldtimer," and a more central participant as compared to those without prior experience in that discipline. Occasionally, participants directly asserted their relative expertise, as Sandra did in her comments above, and as Lillian did when she exclaimed in her journal, "I'm excited about sharing my passion and love for children's theater with my [teaching] partner who doesn't have any experience with it." These statements often ring with pride in one's capability. For example, in the child development course journal, Tessa recounted, "Last week in class we discussed some of the psychological barriers that can be found for teachers. As a psychology major, I immediately began listing them off." Statements like these suggest that the course is allowing a student to experience herself as someone with competence in her home discipline.

More common than direct assertions of expertise were statements in which participants referenced their prior experience as a warrant for their insights. For example, on the discussion board in the child development class, Sandra offers some thoughts about teachers who are under-prepared in classroom management techniques, and begins her comment by locating the source of her understanding in her prior experiences in education:

> I've read, and observed in various classrooms I have worked in, that one of the [sources] of the dilemma of a lack of these skills comes from lack of teacher education on the subject, which in turn comes from a lack of time for them to be educated.

Similarly, when Sarah offers the following thoughts to her arts education classmates, who were debating in class whether to let children use ready-made material from television shows in their improvisations, she notes her prior experiences at drama camp:

> I've played that game at summer camps and we'll have that happen a lot, they start to tell a real story, like they'll tell Hannah Montana or whatever and the women who ran the camp really didn't like them to do that, but I thought it worked because it was still them all working together to do it and it was still them not blocking each other's ideas . . . I don't think the purpose [of the exercise] is to be creative and make something up, it's to work together.

In moments like these, in which a student is able to draw on a relatively more developed understanding of disciplinary problems than her newcomer peers, that student experiences herself as a central member of her chosen community.

Comments from students in both courses indicated that course experiences created an opportunity for them to embrace identities in their chosen profession. For example, Kevin, a student in the child development course, noted a new commitment to being a teacher, explaining in his journal that by providing challenges and opportunities to learn within his chosen discipline of education, the course "has refocused me on what I want from my life." Kim, a psychology student in the child development course describes in her journal how the course crystallized her commitment to enter the field of school counselling:

> I feel like what I have learned from this class has helped me understand children's behavior/emotions (and teachers' as well) better than I did before. I think developing this understanding and building skills in dealing with knowledge about these issues has grounded me in my decision to pursue more work in this field.

Kristen, an education major in the arts education course, described how the course helped her understand the impact she could make as a teacher, noting in an interview, "It is a very powerful moment to witness a child learn a new skill or have a better understanding of a storyline because of the lesson I have designed."

Additional comments demonstrate that, at least for some students, working at the intersection of two disciplines made the value of their own disciplinary knowledge more salient. For example, Sandra, a student in the child development course, reflected on the exuberance she had displayed during a class discussion in which she shared several valuable education concepts with her non-education-based peers.

> I am getting so excited this year as a senior education major and I am finding this incredible passion for education. I guess I feel excited when I realize how much I know and that my education has paid off but I am also so passionate about making change [through field placement in the course]. I think sometimes it might come off as boastful but I get so excited I feel like I could burst!

In some cases, working at the intersection between their own discipline and another allowed participants to gain a new perspective on their chosen discipline. For example, by witnessing the effects on children of participating in theatre in an educational setting, Maya, a theatre major, gained a concrete understanding of how theatre can enrich lives. After noticing that her students were beginning to function less as separate individuals and more as a collective ensemble, she observed in her journal,

> Theatre connects people on a deeper level than just being in a classroom or playing "pattycake" It's a collaborative art, and in schools today, if kids aren't involved in theatre or any form of arts education, they aren't going to know the joy of that experience. . . . [Our students] will have felt a deeper connection to a group of people after having worked with them [in the theatre class] for a whole semester.

Elementary education major Brooke, through her experiences in the child development course in which the role of socio-economic context on developmental outcomes for children was emphasized, began to understand the importance of working where the need is greatest. She wrote in her journal, "I am starting to shift my view about staying to teach in [the local area] . . . I really see now that

unprepared/apathetic teachers combined with a low SES urban area is purely detrimental for students." She further reflected,

> I had a grand plan to attend graduate school and maybe start with non-profit work, but I am starting to realize that I can make a direct impact in at least some students' lives starting in less than a year from now [as an elementary teacher].

Brooke did indeed become a local elementary teacher the next year.

Becoming a Multimember

Both courses provided students with legitimate peripheral participation (Lave & Wenger 1991) in a new field, which allowed them to understand that field in a more sophisticated way. In many cases, this involved students from outside education expressing greater awareness of the complexity of the field and its robust knowledge base. Psychology major Katherine noted in her journal, "As someone without any background in education studies, I am struck by the multitude of factors that are critical to successful teaching." She further noted, "I've been really impressed with the education program here and it seems so rich, I don't know of a better way to describe it, just very rich with knowledge." Another psychology major, Kim, expressed in her journal admiration for the sophistication of her education-major classmates: "It's clear that Sandra and Brooke have backgrounds rich with education theory and instruction-focused classroom experience and have spent a lot of time developing their own classroom philosophies." Sarah, in the arts education class, developed a changed understanding of the value of the teaching profession, so much so that she shifted her career goal from being a theatre director to being an educator. She explained in her journal,

> I wasn't sure I wanted to be a teacher [before taking the course] because I just kind of wanted to do more with my life, but I feel like this class has helped me to see that just being a teacher is a good thing to be.

In contrast to the Lewitt et al. (2010) study reported above, we did not see any examples in which a course led students to stereotype their own or each other's disciplines. We did see one example, however, of a student re-thinking a stereotype that she had at the beginning of the course. This was Sarah's statement, quoted above, that before the course she "just kind of wanted to do more with [her] life" than be a teacher, implying that teaching was less than a worthwhile profession. Sarah explained that through the course she began to understand the value of the teaching profession. In fact, after graduation, Sarah became a sixth-grade reading, math, and science teacher.

We also found evidence that the courses helped participants discover their abilities to collaborate across disciplines. Although at the beginning of each course some students expressed apprehension about engaging with another discipline, these concerns were alleviated by the end of the semester. In the child development course, both psychology majors and education majors expressed an increased sense of efficacy for working in the other discipline. In the arts education course, students not only felt more confident working in the other discipline, but they also began to see cross-disciplinary collaboration as a viable pursuit. Dorothea, a Human Services major, explained in a journal entry at the start of the course that although she was experienced and comfortable working with children, "Unlike many members of the class, I have no theater experience which might put me at a disadvantage. . . ." By the end of the course, however, Dorothea exclaimed, "As we all know, I had never done anything involving theatre, but by being willing to give it a try, I was pleasantly surprised that I was able to teach it!" She further explained,

> I've always thought that you had to be an expert at a subject to be a good teacher; however, with a strong support group of people who are willing to work with you, it is possible to be inexperienced and still do a good job.

Jane, also in the arts education course, noted in her journal, "The most important thing I have learned in this class has been to [be] open minded about trying new things." Stated more broadly, these students began to see themselves as multimembers, as professionals who are capable of crossing boundaries into other professional communities.

Discussion: Interdisciplinary Courses as Sites for Professional Identity Development

Our analysis revealed a form of learning that is much more transformational than the mere acquisition of information about, or basic skills within, a new discipline. Our data suggests that these cross-disciplinary experiences helped to change the way students understand themselves in relation to their chosen field as well as in relation to a new one. Not only did students learn from each other, they were aware of doing so, and they were aware of their own role in their classmates' learning. In this way, these courses positioned students as relative experts in their field, or, to use Wenger's (1998) term, as more "central" participants. This positioning, along with experiences of legitimate peripheral participation in one's chosen community served to alter student's understandings of themselves within their fields and allowed them to embrace an identity as knowledgeable, capable practitioners. At the same time, legitimate peripheral participation in a new community allowed students to experience themselves as effective collaborators across disciplines.

Based on our findings, we assert that interdisciplinary courses have the potential to be of great value to disciplines that are preparing students to enter particular professional communities. Because students in such courses have the opportunity to function as relative experts, helping their peers learn the practices of a community to which they are more central, interdisciplinary courses can serve to solidify students' identities as future professionals within that community. By providing an opportunity to see their chosen community through a new lens, such courses can also deepen students' understanding of the aims and importance of that community and can clarify their role within it. In addition, by engaging students in participation in a new community, interdisciplinary courses offer students a foundation for future cross-professional collaboration.

We would note that both courses in this study were community-engaged learning courses that involved students in collaborative problem solving. As such, they were highly interactive, which provided many opportunities for students to share ideas and knowledge and thereby experience themselves as knowledgeable. Further, problem solving in the real world has real consequences, and therefore, the legitimate peripheral participation the courses provided was saliently "legitimate" – in the arts education course, students were doing real teaching, and they were teaching real performance techniques used in the theatre community; in the child development course, students were supporting the development of actual children in actual classrooms. We suspect that, at least in part, it was students' experience of real success, as they collaborated to address deeply felt challenges, that drove the "transformative trajectory (Hodge, 2014), in which an identity as a newcomer or "academic" learner yielded to an identity as an active, impactful, and committed participant. By contrast, although most of the interdisciplinary courses reported in the research described earlier involved students in collaborative problem solving authentic to the relevant disciplines, only in Lam's (2005) study did students engage collaboratively in the world outside the classroom. Future research might investigate the best ways to design interdisciplinary courses with high levels of student interaction while offering participation at the right level of "legitimacy" for students to experience both the challenge and the success that our study suggests is necessary for deeply transformative learning.

Conclusion

By offering entrée into a new community of practice while positioning students as relative "old-timers" in their own disciplinary communities, interdisciplinary courses transform students' professional identities and boost their efficacy for collaboration across disciplines. Our findings offer insights that may inform interdisciplinary courses across the college campus, particularly when there is interest in developing students' sense of themselves as future practitioners of a particular discipline or in developing an understanding of how two disciplines may synergistically serve each other's aims.

Further research should examine the specific components of interdisciplinary course design that are most important for fostering the transformative outcomes we describe. Such research may fruitfully engaged Mezirow's (2000) concepts of the "disorienting dilemma" and "critical reflection" as key components of the transformation process. For the present, we note that our findings, in combination with existing research on interdisciplinary courses, suggest the importance of high levels of student-student

interaction, which offers students opportunities to teach each other, and of engaging students in real-world collaborative problem solving, which creates a context in which they can experience their own expertise as well as find value in each other's disciplines.

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Thought Mining: Constructing Transformative Insights by Noticing and Contemplating Resonant Manifestations of the Mind

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Abstract

In this essay, we introduce thought mining as a strategy for making transformative shifts to the way a person thinks by constructing meaningful insights from vast arrays of thoughts through deliberate processes of noticing and interacting with what is resonating in their mind.

Keywords: Thought Mining, Transformative Learning, CORCE model

Thought Mining: Constructing Transformative Insights by Noticing and Contemplating Resonant Manifestations of the Mind

Introduction

Many of the transformative shifts we encounter across the course of our lives largely depend on how we notice, interpret, and navigate the elements of our internal and external worlds. Maneuvering through our internal world requires us to interact with seemingly endless streams of thought that effortlessly make their way into our minds. While our thoughts are difficult to quantify, Tseng and Poppenk (2020) estimated that we think as many as 6,000 thoughts in a single day during our waking hours. The field of transformative learning emphasizes the significance of the many thoughts we think by reinforcing the teaching that making adjustments to the way we perceive the world can directly influence the quality and effects of our actions in the world (Chew, 2015; Hoggan, 2016; Mezirow, 2006; O'Sullivan, 2002). Taking into consideration the vast number of thoughts that flow through our minds, the limited moments to process our thoughts, and the critical consequences of our thoughts, it is worthwhile to explore how we determine which thoughts make sense to ponder further and how we glean useful insights from the thoughts we think. In this essay, we introduce thought mining as a strategy for making transformative shifts to the way a person thinks by constructing meaningful insights from vast arrays of thoughts through deliberate processes of noticing and interacting with what is resonating in their mind.

Definitions

Our definition of thought mining has connections to data mining literature. Data mining is generally concerned with applying data analysis techniques to extract meaningful insights from large data sets (Barua & Mondal, 2019; Fayyad et al., 1996; Gupta, 2014). Based on this interpretation of data mining, we define *thought mining* as the act of extracting meaningful insights from an array of thoughts by noticing and contemplating resonating manifestations of the mind. A single resonant element of thought that is noticed and contemplated may, in and of itself, be insightfully transformative. Or, multiple resonant thoughts that are seemingly related or disparate in nature could be noticed, synthesized, and

contemplatively refined to create new insights, which could lead to the generation of even more new transformative insights, and so on. A single thought leading to a sudden transformative shift would reflect an epochal transformation, whereas a progressive sequence of thoughts leading to a transformative shift would reflect a cumulative transformation (Mezirow, 2006).

Thought mining is an inflection of the term, *thought mine*, which may be used as a verb or a noun. As a verb, thought mine means to extract meaningful insights from an array of thoughts by noticing and contemplating resonating manifestations of the mind. As a noun, a thought mine is an array of thoughts from which meaningful insights may be extracted. A *thought miner*, thus, is an individual who engages in the practice of thought mining. Thought miners pay deliberate attention to the diverse thoughts and perspectives of themselves and others to help make meaning out of the world in ways that positively influence their ability "to take effective action in a democracy" (Mezirow, 2006, p. 30).

Origin

The concept of thought mining emerged through an unintended thought mining incident that spontaneously occurred when the first author (Nathan) awoke from a deep slumber in the middle of the night. After he woke up, he struggled to fall back asleep as his mind raced with countless meandering thoughts. He recognized that he was feeling overwhelmed by his continuously random stream of aimless thinking and eventually began to apply detachment strategies related to Buddhist mindfulness (e.g., Kabat-Zinn, 1994), presence (e.g., Tolle, 1999), and awareness (e.g., Rubin, 2023) practices that allowed him to objectively observe, rather than be consumed by, the incessantly sporadic occupants of his mind. Consequently, he found himself settling into a state of consciousness that was conducive to being an observer of the thoughts he was thinking. The phrase, thought mining, passed by his scope of awareness and captured his attention with a deeper level of energy than the other thoughts that had been crossing his mind. He began to engage with the phrase by contemplating it further and jotting notes in his phone related to the phrase. The process yielded an inaugural extraction of its meaning in the form of a written reflection with initial interpretations of a working definition of thought mining, types of thought mining, and methods of practicing thought mining. The initial reflection served as foundational content for this essay. The meaning of thought mining continues to evolve, as evidenced by the preparation of this essay.

Types

Three different types of thought mining have been identified: internal, external, and shared. Internal thought mining, prompted by thoughts within oneself, refers to the extraction of meaningful insights from one's own array of thoughts. External thought mining, inspired by others' thoughts, represents the extraction of meaningful insights from an array of thoughts representing one or more individuals outside of oneself. Shared thought mining, occurring between thoughts that are inside of oneself and thoughts of one or more others that are outside of oneself, is the extraction of meaningful insights between the thoughts of oneself and at least one other person.

Practice

The CORCE model is a semi-structured frame of reference for guiding a thought mining practice. The model comprises five phases: (C)onsciousness, (O)bservation, (R)esonance, (C)ontemplation, (E)xtraction (Figure 1). The CORCE model echoes tenets of creative thinking by representing a cognitive process that promotes original and effective thought (Runco & Jaeger, 2012). For example, being conscious allows a thinker to observe, resonate with, and contemplate original thoughts as means of extracting valuable insights that may have positive effects on how they interpret and interact with the world.

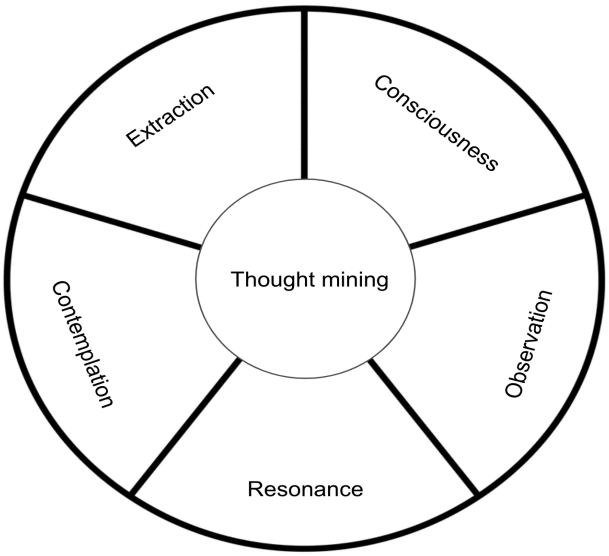

Figure 1: *CORCE Thought Mining Diagram*

On the surface, when viewing the CORCE model diagram beginning with the consciousness phase and following the framework through a clockwise fashion, each phase is a prerequisite for its subsequent phase. More specifically, CORCE suggests that being in a conscious (i.e., mindful, present) state is essential for an individual to be able to observe their thoughts; observing their thoughts is essential for being able to resonate with one or more of their thoughts; resonating with their thoughts is essential for being able to contemplate them further; and contemplating their thoughts is essential for them to be able to extract meaningful insights from their thoughts. In practice, though, it seems likely that a person will naturally weave in and out of the stages. For example, when they are in the contemplation phase, their ongoing state of consciousness may allow them to observe and resonate with new thoughts that pass through their mind, which could further influence their contemplative practice and, thus, the types of insights they extract through the process.

Consciousness

In the *consciousness phase*, an individual enters into a state of consciousness in which they are able to be aware of and attentive to the authentic conditions of the present moment. According to Damasio (1999), "consciousness is, in effect, the key to a life examined" (p. 5) as our approach to paying attention to the present moment can have direct effects on the quality of our thoughts (Siegel, 2007). The essence of what it means to be in a state of consciousness is linked to various academic and spiritual sources related to concepts of consciousness, mindfulness, and presence (e.g., Brown & Ryan, 2003; Chopra, 1994; Goleman, 2012; Kabat-Zinn, 1994; Newman, 2006; Searle, 1998; Tolle, 1999). For example, Kabat-Zinn (1994) referred to mindfulness as "the art of conscious living" (p. 6) and Tolle (1999) described presence as "pure consciousness" (p. 121), which Chopra (1994) referred to as our "spiritual essence" (p. 18). In the consciousness phase, the individual carries themself with an "openness to new information" (Langer, 1989, p. 62), nurturing "greater awareness, clarity, and acceptance of present-moment reality" (Kabat-Zinn, 1994, p. 4) in ways that allow them to nonjudgmentally notice their thoughts. Being in a conscious state allows them to proceed to the observation phase.

Observation

In the *observation phase*, the individual observes thoughts as they enter into their field of awareness. Observing one's thoughts is a practice of watching what's occurring inside oneself in the

present moment (Rubin, 2023). In this phase, the individual refrains from engaging with their thinking and simply witnesses their thoughts through a nonjudgmental lens as they pass through their mind (Davis & Hayes, 2011; Rohr, 2018; Walach et al., 2006). They are "purely noticing what is happening without evaluating, analyzing, or reflecting upon it" (Hülsheger et al., 2013, p. 311). Being an observer of their thoughts from a detached perspective allows them to proceed to the resonance phase.

Resonance

In the *resonance phase*, the individual allows themself to resonate with the energy of a thought they are thinking that may be attempting to connect with them at a deeper level. The resonance phase is linked to awe, which has been characterized as an emotion that people feel when they "encounter something physically or mentally grand that requires them to adjust their mental structures to make sense of the stimulus" (Yuan et al., 2024, p. 412). Based on this description, a resonating thought could be considered a mentally grand stimulus that seems to have potential to mean more than it is perceived to mean on the surface when it is initially noticed. Resonance also reflects echoes of Emerson's (1883) sentiments that "A man should learn to detect and watch that gleam of light which flashes across his mind from within" (p. 43). He suggests that if a person is not in a conscious state conducive to noticing such a glimmering thought, they are at risk for dismissing it simply because it is theirs. If an individual finds themselves feeling a stronger sense of resonance with a thought that enters their stream of awareness, the deeper connection they are feeling may be an indicator that the thought is worthwhile to ponder further. Being in awe of something, which may manifest as a resonant thought, can stimulate acts of reflective and creative thinking (Lucht & van Schie, 2024). Therefore, feeling a sense of resonance with a thought positions an individual to proceed to the contemplation phase.

Contemplation

In the *contemplation phase*, the individual puts time and energy into contemplating their resonant thought. They engage with the thought by allocating a greater degree of attention to the thought and allowing other related thoughts to arise and synthesize with the thought. The contemplation phase is linked to literature related to metacognition and self-reflection. Metacognition generally refers to an individual thinking about their thinking (Cross & Paris, 1988; Flavell, 1979; Kuhn & Dean, 2004). Self-reflection refers to "the inspection and evaluation of one's thoughts, feelings and behavior" (Grant et al., 2002, p. 821). A few examples of methods of engaging with a resonating thought may include interpreting the thought through subsequent thinking, oral dictation, writing, or discussion. Arts-based reflective approaches, such as painting, photography, music, or dance (Harvey et al., 2016) may also be employed during this phase. Regardless of the method, contemplating the thought allows an individual to advance to the extraction phase.

Extraction

In the *extraction phase*, the individual extracts meaningful insights as a result of their contemplation. According to Grant et al. (2002), the term, insight, refers to "the clarity of understanding of one's thoughts, feelings and behavior" (p. 821). An individual's insights may manifest as transformed understandings or perspectives that could influence how they respond to and otherwise interact with the conditions of the world (Chew, 2015; Mezirow, 2006; O'Sullivan, 2002). Their new insights are essentially the result of the transformative learning that they experienced through their implementation of the CORCE method.

Scenarios

This section provides examples of internal, external, and shared thought mining scenarios. The internal and external scenarios are personal examples representing a couple of Nathan's experiences. The shared thought mining scenario is an example from one of Nathan and the second author's (Derek's) discussions. Each example includes a title, contextual backdrop, description of how each phase of the CORCE method applies to the scenario, and a summary.

Internal Thought Mining

Title. Extract meaning from a sporadic resonant thought.

Context. Nathan attended a four-day silent retreat at a serene meditation center. His days typically consisted of multiple 30-45-minute sitting and walking meditations, three silent meals, a work meditation, a guided meditation, a talk by retreat teachers related to meditation practice, and unstructured silent time. Upon conclusion of the retreat, prior to departing the meditation center, he sat outside on a bench for a bit and admired the beautiful landscape. Many thoughts passed through his mind during those moments. This scenario uses the CORCE model to explain how Nathan extracted meaning from a thought that resonated with him as he sat on the bench and cast his gaze toward the horizon.

Consciousness. A few complete days of consistent, deliberate meditation practice—leading up to the moments when Nathan sat on the bench—positioned him in a state of consciousness conducive to noticing intricate attributes of his internal and external worlds.

Observation. He observed a multitude of thoughts flowing through his mind as he witnessed the natural beauty surrounding him.

Resonance. At one point, he noticed a flock of birds in the sky that appeared to be creating shapes in their formations. After the birds departed, the following phrase arose in Nathan's mind and began to resonate with him: "Shine your love into the world when you leave." The phrase periodically returned to Nathan's mind over the next few days.

Contemplation. Nathan's persistent resonance with the phrase prompted him to begin contemplating its significance as it would resurface in his mind. Around a week after the retreat concluded, since the phrase had been making daily appearances in his mind, he decided to reflect on it further by jotting down notes related to the phrase and formulating them into a coherent interpretation of what it might mean.

Extraction. Nathan's process of jotting notes and formulating them into a digestible narrative yielded an extracted meaning for him in the form of the following written reflection.

> *Shine your love into the world when you leave. I saw a formation of birds flying above the hilltops on the last day of the retreat. They started making shapes in the sky. The first shape I saw was a star. After they formed the star, they dispersed and then flew back together to create the shape of a heart. After they formed the heart, they arranged themselves in a line and flew out of sight. I interpreted the star to mean "shine." I interpreted the heart to mean "love." I interpreted lining up and flying out of sight as "leaving." Taken together, the message I received from the birds was to "Shine my love into the world when I leave."*

Nathan interpreted the phrase to be a message of encouragement to carry himself in a manner that would be conducive to consistently emitting authentically loving energy wherever he went, and it seemed to influence the extent to and ways in which he exhibits love through his daily interactions.

Summary. This internal thought mining scenario reflects a specific use case related to extracting meaning from a resonating thought that surfaced through an array of thoughts that passed by Nathan's scope of awareness during a few brief moments in time. The practice could be adapted for extracting meaning from virtually any array of thoughts within oneself.

External Thought Mining

Title. Extract meaning from a brief inspirational video.

Context. Nathan is part of a small group of friends who share brief, positively-oriented reflections with one another five days per week. Every Monday through Friday around 6:00 am, the coordinator of the group texts the same video to each group member along with the name of one member who is assigned to share their interpretation of the video. The videos tend to range from 5-15 minutes in length. The assigned member watches the video, writes a reflection on the video, and texts their reflection to the other members of the group on the same day that they receive the assignment. This scenario uses the CORCE model to explain how Nathan extracted meaning from the messages in one of the videos that was assigned to him. Nathan received the text with the video around the time he woke up in the morning, and he listened to the video before he got out of bed for the day.

Consciousness. Prior to pressing play on the video, Nathan closed his eyes and focused on his breath for a few moments to help detach himself from the chatter in his mind as well as any external distractions in the room that may have been competing for his attention. He opened his eyes briefly to press play and then closed his eyes again so he could attentively listen to the message in the video.

Observation. The video was close to 15 minutes in length. The general theme of the video focused on regularly expressing gratitude. Nathan observed the messages being conveyed in the video as he listened attentively to what was being said.

Resonance. Some of the messages in the video began to resonate with Nathan as he listened. He felt particularly drawn to the messages related to giving gratitude daily and writing a list of ten things to be grateful for.

Contemplation. Nathan jotted his initial thoughts about the messages from the video that resonated with him in the Notes app on his phone and then contemplated them through an iterative process of wordsmithing and further pondering his thoughts in relation to the video's messages to help bring them to life in a coherent manner.

Extraction. Nathan's iterative process of pondering and wordsmithing his thoughts related to the video extracted meaning for him in the form of the following written reflection that he sent to the group members:

> *Give gratitude in all things. Similar to a parent who is eager to continue giving to a grateful child, the divine energy of the universe is eager to continue giving to us if we express appreciation for what we have been given. The video included a recommendation for practicing gratitude by making a list of 10 things that you are grateful for. Here are 10 things in no particular order that I am grateful for from this past weekend:*
>
> - *The positive energy that I felt throughout the interactions that I had with my family and friends at the lake.*
> - *My kids being able to spend quality time with close friends on and off the water.*
> - *The friends who helped me dig trenches and haul boulders to build a rip rap retaining wall at our cabin.*
> - *The lumber yard still being open on Saturday afternoon so we could purchase cinder blocks and additional mortar to finish the retaining wall stairs.*
> - *The apologetic honesty of our friend who accidentally backed a vehicle into our parked pickup.*
> - *Our neighbors letting us use their garden cart and tamping tool as well as for the refreshing margarita they made for me at the end of a long day of working outside in the sun.*
> - *Multiple beautiful fireworks displays.*
> - *Playing pickleball with old and new friends.*
> - *Playing cornhole with family and friends.*
> - *Friends and family who brought and cooked delicious food.*
>
> *Compiling this list has been a helpful exercise in reflecting on a few of the many good things that I experienced over the past few days. I feel like it could be much longer. There seem to be several other things from the weekend that are not listed, including watching today's video, which prompted me to contemplate some of the things that I'm grateful for. I very much appreciate the opportunity to be in this group. Blessings to you all.*

Extracting a gratitude-oriented meaning from the video positively influenced Nathan's thoughts and the way he carried out his tasks and interactions with others throughout the remainder of the day as it positioned him to perceive his experiences through a lens of appreciation for the value that inherently accompanied each moment.

Summary. This external thought mining scenario reflects a specific use case related to extracting meaning from a brief inspirational video. The practice could be adapted for extracting meaning from virtually any written, audio, video, or other type of content outside of oneself.

Shared Thought Mining

Title. Shared thought mining

Context. Nathan and Derek co-host a conversational podcast. The purpose of the podcast is to extract meaningful insights from an assortment of thought patterns through contemplative discussions about resonating thoughts. Each episode begins with a thought that has been resonating with one or both of the hosts and then proceeds with a free-flowing, reflective conversation to explore deeper meanings of the initial thought as well as other thoughts that surface through the discussion. This scenario uses the CORCE method to demonstrate how Nathan and Derek collectively extracted meaning from a thought that initially resonated with Derek during one of their discussions.

Consciousness. As Nathan and Derek prepared to engage in a discussion on their podcast, they practiced a three-minute silent meditation to help cultivate a state of consciousness conducive to an enriching discussion.

Observation. Nathan and Derek silently observed the thoughts that flowed through their own minds during the meditation period. Then, as their conversation ensued, they observed each other's thoughts as they articulated them to one another.

Resonance. As their conversation continued, Derek commented on how busy schedules and tendencies for people to be enticed by external distractions, such as television shows, video games, and physical activities, can be barriers to connecting with one's own thoughts and engaging in reflective practices. The topic resonated with both Derek and Nathan, and they felt that it would be worthwhile to discuss further.

Contemplation. Derek and Nathan collectively contemplated their resonant thoughts related to distractions and busy schedules through further discussion. The nature of their conversation represented an intersubjective contemplative practice that occurred spatially between them rather than inside of or outside of them (Gunnlaugson, 2009). Their discussion led to Derek commenting on how it could be helpful to intentionally carve out time for reflection, which led to Nathan commenting on how a seemingly profound thought will sometimes suddenly pop into his mind in a random location at an unexpected time, which led to Derek commenting on how it is important for a person to leave space for something surprising to arise within their scope of awareness at any point throughout their day.

Extraction. Nathan and Derek's conversation yielded extracted meaning for them in the form of a descriptive visual that Derek proposed: "[for] a lot of us, everything's organized in these sorts of ways and we don't have an empty shelf sitting there for what might come today that we're not expecting." The empty shelf visual influenced how Nathan and Derek carried themselves throughout their subsequent days as, when they periodically thought about the visual, it seemed to help them remember to stay present and remain open to unexpected possibilities. They also discussed the empty shelf visual further in subsequent podcast episodes.

Summary. This shared thought mining scenario reflects a specific use case related to extracting meaning from a resonating thought that surfaced through a conversation between Nathan and Derek. The practice could be adapted for extracting meaning from virtually any thoughtful discussion between two or more people.

Discussion

The CORCE model provides a frame of reference that may help facilitate a thought mining practice. Nathan initially developed the CORCE model to help improve his understanding of key elements and processes that contributed to him gleaning transformative insights through some of his prior experiences with noticing and reflecting on resonant thoughts. The model reflects a synthesis of literature related to creative thinking, consciousness, mindfulness, presence, awe, metacognition, self-reflection, insight, and transformative learning.

Examples of internal, external, and shared thought mining practices were provided. The internal and external thought mining scenarios demonstrated how writing during the contemplation phase can yield a tangible extraction of meaning in the form of a written narrative. The shared thought mining scenario demonstrated how engaging in an auditory discussion during the contemplation phase can yield

an intangible extraction of meaning in the form of a descriptive visualization that simply exists as a mental image within one's mind.

It should be noted that transformation is a potential outcome of thought mining through the CORCE method; however, it is not a guaranteed outcome. For example, O'Sullivan (2002) indicated that transformative learning reflects "a deep structural shift in the basic premises of thought, feeling and action" (p. 11). It is possible for a thought mining practice through a CORCE lens to create deep structural shifts, as partially evidenced by the scenarios described in this paper; however, it seems unlikely that every thought mining iteration would yield such shifts. Due to the recency of its inception, according to the time that this manuscript was prepared, the CORCE model has not yet been scaled to a broader audience or empirically tested.

Recommendations

Thought mining is an emerging transformative learning strategy reflecting a synthesis of established concepts. To date, the sample size of CORCE model users (i.e., us, the authors) has been small, but the effects on us have been profound. Utilizing the CORCE model has positively affected our lives, and we see great potential for the model to positively impact others as well. Therefore, we hope this essay expands the reach of the thought mining concept and CORCE model to broader audiences so they may explore whether and how the concept and model could be applied to support their own transformation as well as transformative opportunities that they could create for others.

We recommend that practitioners and researchers explore possibilities for advancing the evolution of thought mining and the CORCE model. Educators could develop curriculum and activities around the CORCE method or the general concept of thought mining to create opportunities for students to engage in the practice, which could help respond to a need identified by Kostara et al. (2022) for more practical applications of transformative learning. Although the CORCE model has not yet been implemented in a formal learning setting, potential 45-minute internal, external, and shared thought mining activities for students are outlined in Table 1. Implementing a 45-minute CORCE thought mining activity on a single occasion could potentially stimulate an epochal transformation, whereas implementing the activity multiple times (e.g., 1x/week) across an academic term may contribute to a cumulative transformation.

Table 1

Internal, External, and Shared Thought Mining Activities for Students

<table>
<tr><th></th><th>Internal</th><th>External</th><th>Shared</th></tr>
<tr><td>Time</td><td>45 minutes</td><td>45 minutes</td><td>45 minutes</td></tr>
<tr><td>Participants</td><td>Self (S)</td><td>Self (S)</td><td>Self (S), Partner (P)</td></tr>
<tr><td>(C)onsciousness
10 minutes</td><td colspan="3">Participants engage in silent or guided meditation to help settle into a conscious state of awareness. During this time, depending on the type of meditation, they may find themselves beginning to observe their thoughts.</td></tr>
<tr><td rowspan="2">(O)bservation
5 minutes</td><td>(S) watches their own thoughts from an objective perspective.</td><td>(S) reads, watches, or listens to content reflecting the thoughts of someone else.</td><td>(S) and (P) watch their own thoughts from an objective perspective.</td></tr>
<tr><td colspan="3">As participants notice a new thought, they write or mentally note a word or brief phrase reflecting the thought.</td></tr>
<tr><td>(R)esonance
5 minutes</td><td colspan="3">Participants review the words or phrases representing the thoughts that they wrote or mentally noted. As they review the thoughts, they pay attention to the level at which they feel intrigued or fascinated by each thought. Then they choose the thought that ignites the greatest sense of awe or resonance within them.</td></tr>
<tr><td rowspan="2">(C)ontemplation
20 minutes</td><td colspan="2">(S) reflects on the resonant thought they selected by writing a reflection or recording an oral reflection.</td><td>(S) and (P) reflect on their resonant thoughts by discussing them with one another. They discuss (S)’s thoughts for 10 minutes and (P)’s thoughts for 10 minutes.</td></tr>
<tr><td colspan="3">Reflections may be free-form or structured. If structure is desired, reflective prompts may be helpful (e.g., What does the thought mean to you? How does it make you feel? How does it relate to your life? What questions do you have about the thought? What are your initial responses to the questions you have?)</td></tr>
<tr><td>(E)xtraction
5 minutes</td><td colspan="3">Participants describe key insights gleaned through their reflections during the contemplation phase and explain how their insights could influence the way they perceive and interact with the world.</td></tr>
</table>

Beyond formal learning environments, anyone could practice thought mining as a way to help them tap into the insights that are in the depths of their mind. We suggest you give it a try for yourself to see if it influences your ability to extract meaning from the thousands of daily thoughts that permeate your consciousness. Based on our own experiences with thought mining, we believe that a person could naturally weave the practice into the fabric of their everyday existence. In such cases, they would consistently navigate the normal tasks of their daily lives in a state of consciousness conducive to both observing their thoughts and feeling a sense of resonance that serendipitously accompanies some of their thoughts, which would prompt them to contemplate and extract transformative meaning from the resonant thoughts that passed through their field of awareness. As the exploration and implementation of thought mining practices advance, we encourage researchers to conduct studies related to its implementation and effects, including its impact on measurable outcomes related to metacognition, self-reflection, and progress toward transformational learning.

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