DIGITAL IDEATION: POSTSECONDARY STUDENT CREATIVE THINKING EXPERIENCES USING ONLINE PEER ASSESSMENT

by

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Abstract

Groupwork and the ability to think creatively are critical skills that help drive societies forward and are top attributes employers look for in graduates. While these skills are often integrated into curriculum, postsecondary institutions must do more to advance these skills in learners. Researchers have explored how emerging technologies such as online peer assessment support higher order skill development in postsecondary students. While studies have focused on peer-to-peer assessments, there has been limited investigation into ways that online peer assessment could support creative thinking within teams. An explanatory mixed methods approach was used to explore postsecondary student creative thinking experiences using online peer assessment. A sample of 40 students participated in the study, who were randomly assigned to teams to complete a multi-phased creative ideation activity using peerScholar, a leading online peer assessment platform. An interactive survey was distributed to participants to measure the degree to which online peer assessment was perceived to support team-level creative thinking. Analysis of the quantitative data showed that in general, teams felt creative thinking was supported by online peer assessment. To gain a deeper understanding of the processes teams used during the activity that may have led to the quantitative results, content analysis of the captured interactive dataset showed that participants most often provided supportive, suggestive, or problem-identifying feedback on their teammate’s ideas. After online peer assessment, ideas became more refined or more clearly communicated, were withdrawn or combined, or entirely new ideas were generated. From this analysis, two frameworks were introduced: the first outlining the various forms of
feedback participants used as they commented on their teammate’s ideas, the second
summarizing the potential effects feedback might have when online peer assessment is
used as an interface to facilitate the sharing and evaluating of ideas in teams. The results
of this thesis expand the literature by exposing that online peer assessment could be an
effective means of supporting creative thinking within teams. New avenues of
exploration in creativity research are discussed that are expected to benefit postsecondary
educators in their efforts to support groupwork and creative skill development in
students.
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Chapter 1

Introduction

Personal Statement

As a creative person, I enjoy collaborating with others. From writing music in rock bands, to working with cross-functional teams in business, I have often found that I have been able to generate more creative ideas working with others than working alone. Yet as I began my career as a postsecondary educator, I found that many students did not share my passion. As I discovered, these students often came from educational systems that discouraged creative risk-taking, where schools are more a place of competition than collaboration.

One of the courses I taught early in my career required students to work on creative projects in teams. To help teams form project ideas, I decided to dedicate one of my classes to a team brainstorming exercise. To my amazement, I saw that the activity slowly “broke” the competitive streak so commonplace in my students. The environment began transforming into a hive of creative activity right before my eyes. Students were eager to share their ideas, give feedback and build knowledge together to better prepare themselves for advancing their project to the next stage of development.

With the onset of the 2020 pandemic however, replicating these experiences online became a challenge. Gone were the physical environments students could claim as their own collective, creative spaces where anything seemed possible. Despite my best efforts, I faced diminishing returns in this new teaching environment. Regrettably, I had no choice but to drop the brainstorming sessions from my online classes.
In search of pedagogical solutions, I began exploring potential alternatives to brainstorming that might be possible using educational technology. In my search, I came across online peer assessment, an alternative form of assessment where students learn by reviewing and assessing the independent work of their peers. One aspect of this learning modality that excited me was the opportunity to enhance students’ ability to clarify and formatively refine their own ideas (Southwestern University, n.d.). As knowledge sharing between team members is an essential component of collaborative creativity (Dahlin, et al., 2005), it occurred to me that peer assessment could offer a new way for students to generate and evaluate ideas within their teams outside of class time. Could online peer assessment help stimulate team-based creative thinking that had gone missing in my classes? It is this question, and the desire to explore new ways of using existing learning technologies, that drives this research.

Rationale

As highlighted by Sonnenburg (2004), team-based creative thinking is an increasingly critical skill, since “human beings can often find better solutions for complex situations in collaboration than by working on their own” (p. 255). The ability to collaborate and think creatively are soft skills that continue to remain in high demand (World Economic Forum, 2016), where organizations rely heavily on teamwork as a source of creative innovation (Baruah & Paulus, 2019).

Stimulating creative thinking within teams often requires creative ideation, which occurs as individuals generate and refine initial ideas together to solve a problem or find a solution. Yet while facilitating collaborative creative ideation through such techniques as brainstorming can help foster creative thinking (Gogus, 2012), these effects are not
absolute. As suggested by Paulus et al. (2018), “[a]lthough the theoretical perspectives of collaborative creative ideation suggest positive outcomes for creativity, often the interaction processes in groups may not be well-designed for the effective sharing of ideas and building on them” (p. 3). As a result, scholars have gained interest in exploring more effective alternative techniques to brainstorming, including the use of information technologies to support electronic brainstorming.

Within higher education, students often collaborate in teams to complete assignments and projects or take part in laboratory work or study groups (Cooley et al., 2014). There is evidence to suggest that enhancing team-based skills has direct educational benefits, such as making the learning experience more fulfilling and increasing academic achievement for postsecondary learners (Cumming, 2010; Prichard et al., 2006; Springer et al., 1999). One reason why teamwork is often integrated into postsecondary curriculum may be because teamwork skills are in high demand in the workplace, where employer job postings often cite teamwork as a most desired graduate skill (Bennett, 2002; Branine, 2008). While groupwork can place significant emotional and cognitive demands on students, many educators assume that their students will develop teamwork skills through groupwork itself (Prichard et al., 2006). This is likely why many postsecondary institutions tend to not provide the needed supports for students to understand what is required to successfully work in teams (Johnson et al., 1998).

In recent years there has been a growing interest in how educational technologies can be leveraged to support higher learning and skills development. Online peer assessment is an educational tool designed to support skill development through the reciprocal assessing of work among peers. As collaboration and creative thinking are
considered critical 21st century learning and innovation skills for students (Pacific Policy Research Center, 2010), it is important to explore how online peer assessment could be used in novel ways to foster team-based creative thinking skills development in higher education so that graduates are best prepared for entering the workplace.

Existing research has illuminated how electronic brainstorming may reduce some of the cognitive and social limitations of in-person brainstorming (Baruah & Paulus, 2016; Dennis & Valacich, 1993; Nijstad et al., 2003; Paulus et al., 2013). Studies have also illustrated that specific educational modalities such as project-based learning (PjBL) and problem-based learning (PBL) are able to support collaborative creative thinking skills in students (Chen et al., 2019; Ersoy, 2014; Hirshfield & Korestky, 2019; Villanueva et al., 2011; Wijayati et al., 2019; Winarno, 2018). In addition, research has examined how online peer assessment can support student creative work, most often at the level of the individual (Amhag, 2013; Chang et al., 2019; Cheng, & Tsai, 2012; Dickhut, 2006). Yet while there is extensive research exploring online peer assessment within teams (i.e., intrateam feedback) as it relates to member behaviours and performance (e.g., Donia et al., 2018; Dumand & Galaleldin, 2020; Heslop et al., 2017), there is little study on its utilization in connection to how students think creatively and engage in creative ideation in teams. Building on the literature surrounding electronic brainstorming, collaborative creative thinking and online peer assessment, this study explores how student teams develop shared ideas using online peer assessment as a communication interface. The purpose of this thesis is therefore to illuminate the potential for fostering collaborative creative thinking in postsecondary learners by leveraging existing learning technologies in new ways.
Research Questions

Taking a pragmatic approach, this thesis adopts a mixed methods design to explore not only student experiences but also interactions within teams that may have led to those experiences. Teams are treated as the main unit of study to illustrate both common and diverging ways in which teams moved through their respective collaborative creative ideation processes through text-based communication facilitated through an online peer assessment platform. I aim to develop narratives to describe the evolution of ideas within teams throughout this process. Specifically, I explore how team members share their initial ideas, give feedback on the ideas of their teammates, and what subsequent changes occurred within shared ideas once participants had engaged in the online peer assessment process.

This thesis is expected to add to the growing body of research surrounding online peer assessment administered within collaborative and creative educational contexts and inspire new pedagogical approaches in higher education. By exploring students’ experiences and interactions within their teams, my hope is that a greater understanding of how online peer assessment could be used to support collaborative creative thinking skills in postsecondary learners will be gained. In support of this goal, the following questions are addressed:

1. How do student perceptions of the effectiveness of collaborative creative thinking using online peer assessment vary between student teams?
2. Through online peer assessment, what kinds of feedback do team members provide on the creative ideas of their teammates?
3. How does online peer assessment appear to influence the creative ideation process in teams?

Key Definitions and Theoretical Underpinnings

Creative Thinking in Higher Education

Creativity literature suggests that two main cognitive processing models are associated with creative work: divergent thinking and convergent thinking. Divergent thinking is conceptualized as the ability to produce multiple solutions in response to open-ended problems (Guildford, 1959). In contrast, convergent thinking is described as “the ability to hone in on one idea, one answer that best fits the constraints of a task” (Lubart, 2016, p. 9). Creative thinking is most often associated with divergent thinking, where the two terms are often used synonymously. Ultimately, thinking creatively necessitates using mental processes to repurpose existing knowledge or methodologies “leading to a new invention, solution, or synthesis in any area” (American Psychological Association, n.d). Thus, creative thinking is not an outcome in and of itself but is instead considered a common cognitive prerequisite of creative work.

Within education, creative thinking is recognized as an essential skill in nearly all domains. Revolutionary educational psychologist Lev Vygotsky stressed that in order to prepare learners for the future, fostering imaginative thinking should be “one of the main forces enlisted for the attainment of this goal” (Vygotsky, 2004, p. 88). Consequently, whether working alone or in groups, creative thinking is seen as a critical learning outcome because it can help students master important course concepts and prepare them for the workforce (Parcha, 2020).

Creative Thinking Educational Modalities
Several student-driven approaches to higher learning have been linked with creative thinking in groups. Project-based learning (PjBL) gives students the freedom to plan learning activities, carry out projects collaboratively, and ultimately produce work that can be presented to others (Sumarni, 2018; Yalçin et al., 2009). This modality promotes creative thinking because students must use their imaginations to create new products in support of their projects (Akinoglu, 2008). Conversely, problem-based learning (PBL) stimulates the learning of course concepts and metacognition skills through the application of problems (Davidson & Major, 2014), where challenging and open-ended tasks encourage students to think creatively and consequently express their ideas to others (Chan, 2016).

**Creative Ideation**

Ideation is a term that represents “the capacity for or the act of forming or entertaining ideas” (Merriam-Webster, n.d.). *Creative ideation* is a construct that extends the concept of ideation within a creative context. Graham and Bachman (2004) illustrate that across disciplines, creative ideation is often referred to using different terminology. For example, a researcher may refer to creative ideation as the development of an *invention*, a lawyer *intellectual property*, an officer of a company *innovation* or *intangible asset*, and so on (Graham and Bachman, 2004). Regardless of the terminology used, creative ideation involves “a process of generating original ideas in response to open-ended problems” (Barbot, 2018, p. 1).

Researchers such as Barbot (2018) and Kaufman et al. (2008) concur that measurement of creative ideation is most often facilitated through divergent thinking tests. A well-known and widely used divergent thinking test most associated with
creative potential is the verbal *Torrance Tests for Creative Thinking* (TTCT). Built on the seminal works of American psychologist J.P. Guilford, including Guilford’s Alternate Uses Task (AUT), the verbal TTCT measures divergent thinking based on three main sub scores; ideas generated (fluency), the degree of diversity of ideas generated (flexibility), and the level of distinctiveness among ideas generated (originality) (Baer, 2016; Torrance, 1974). A fourth optional sub score of the verbal TTCT is elaboration, which measures the level of depth or richness of ideas generated (Baer, 2016; Torrance, 1974).

Creative ideation is commonly practiced within groups of individuals. Paulus and Brown (2007) state that when individuals ideate together, they engage in a process whereby ideas are exchanged to collectively develop solutions to problems and create new innovations (Paulus & Brown, 2007). The collective sharing and development of ideas adds an additional new layer of complexity to the creative ideation process since individuals are required to not only generate ideas but also explain their ideas and opinions to others.

David Best discusses the interaction between individual creative ideation and social communication practices in his article, *Can Creativity be Taught?*. Best denies the notion that creativity is a purely subjective personal experience. Instead, Best takes an objectivist approach, arguing that individual creativity is logically dependant on societally practiced forms of expression, such as music, visual art, and language. In this sense, creative ideas can only exist when individuals use requisite modes of articulation and forms of social expression that allow their ideas to be understood by the collective (Best, 1982). Best’s arguments emphasize an important precondition of group-based
ideation; only when individuals convey their ideas through modes of communication meaningful to others can creative ideation in groups be made possible.

**Brainstorming**

As a means of generating and communicating ideas within groups of individuals, brainstorming is a common technique associated with creative ideation. Brainstorming was first introduced as a productivity aid for work teams by Alex Osborn in his book *Applied Imagination* in 1953. Team-level brainstorming can be conducted either openly or by using the nominal group technique, where members commonly generate and share ideas in isolation (Baruah & Paulus, 2019).

Aside from wide adoption in the workplace, brainstorming is supported in educational settings, where it is often used as a learning mechanism. As an educational aid, the act of group brainstorming is rooted in social constructivist learning theory, which “asserts that things do not and cannot have essence because they are defined interpersonally and intersubjectively by people interacting in a network of relationships.” (Patton, 2014, p. 121). Kanuka and Anderson (1999) suggest that group-based brainstorming provides a socio-language process whereby learning occurs as students discover different viewpoints from peers, test their own ideas and negotiate what becomes shared understandings within their groups. Thus, learning through group brainstorming is student-driven, shaped by the process of interactions that take place within student groups. The educational benefits of the brainstorming process are further reinforced by Renner (1997), who posits that student group-based brainstorming may help support team dynamics by inspiring collaborative creativity and synergies among peers.
Electronic Brainstorming

Despite its popularity, Osborn’s (1953) face-to-face (i.e., synchronous) brainstorming technique is not without its detractors. In 1987, Diel and Stroebe claimed that production blocking can arise where time constraints limit the sharing of ideas to one person at a time, which they argued may limit creative effects (Diel & Stroebe, 1987). By the 1990s, researchers began examining alternative collaborative creative ideation techniques, and several pivotal models were introduced. The search for ideas in associative memory (SIAM) model by Nijstad, & Stroebe (2006) expanded on production blocking effects. As a result of the unpredictable nature and length of delays required during synchronous brainstorming, the model highlighted time-related disruptions in mental processing and working memory that may limit idea generation.

In their development of the cognitive-social-motivation model, Paulus and Brown (2007) identified both social and cognitive factors that influence motivation/capability, which they posited had a strong influence on collaborative creative ideation. Pulling from a variety of theories from the works of such scholars as Tulving and Pearlstone (1966), Amabile (1996), Mannix and Neale (2005), Nijstad and Stroebe (2006), and van Knippenberg and Schippers (2007), the authors assert that group creativity is based on cognitive and social factors that “influence task motivation and/or task capability, which in turn influence the creative process” (Paulus & Brown, 2007, p. 260). Paradoxically, while individuals need to be exposed to diverging perspectives to develop their own ideas, creative ideation can be disrupted through social interactions. The cognitive-social-motivation model assumes that creativity is best supported when team members pay close attention to pooled ideas of others through more effective group interaction. Thus, Paulus
and Brown (2007) infer that online ideation tools such as electronic brainstorming best support team-based creative ideation, challenging the traditional face-to-face model of brainstorming originally developed by Osborn (1957).

More recently, technological advancements have created new approaches to facilitate team-based creative ideation. Electronic brainstorming involves the use of computers or other electronic devices to collect and share ideas for group decision making. Electronic brainstorming can be conducted in real-time (i.e., synchronously) or asynchronously using digital media that allow members to engage in discussions and share messages at their own convenience (Baruah & Paulus, 2019).

**Peer Assessment**

Peer assessment is a term used to describe a process in which students evaluate each other's work, traditionally used for peer marking, grading and written feedback of oral presentations, written work, and professional skills (Topping, 1998). Considered a method of *assessment for learning* designed to stimulate higher-order learning through meta-cognitive “self reflection and analysis” (Kritik, 2020, p. 4), peer assessment is described by Wuttisela et al. (2016) to be one of the most effective strategies to enhance learning through social interaction. Through a socio-reflexive process, peer assessment enables both assessors and the assessed to establish norms about what distinguishes “good” work from “bad” (Van Lehn et al., 1995), allowing students to formatively improve their work over time. Brill suggests that peer assessment is situated at the highest level of Bloom’s taxonomy for learning within the cognitive domain, as it supports student analysis, evaluation, and creation (Bloom et al., 1956 in Brill, 2016).
fact, according to Beaman, peer assessment is “tailor-made for creative work” (1990, p. 6).

Theoretical frameworks of peer assessment associate it with foundational social constructivist educational theories, which presuppose that because reality is socially constructed, multiple realities can exist simultaneously and there can be no single objective truth (Patton, 2014). According to seminal educational psychologist Lev Vygotsky, Peer-to-peer interactions may stimulate the assessor's thought processes, allowing them to gain a sense of accountability in communicating purposeful feedback to peers (Vygotsky, 1978). Scaffolded learning, an essential construct of Vygotsky’s concept of zone of proximal development (ZPD), can occur when constructive feedback is provided by competent others (Topping 1998; Vygotsky, 1978). Furthermore, in accordance with Piaget’s cognitive conflict theory, peer assessment may allow for opportunities for learners to resolve cognitive conflict that occurs because of being exposed to feedback from students with similar ability levels but with diverging opinions (O’Donnell, 2001; Piaget, 1977; Topping 1998).

Key insights into the educational benefits of peer assessment within postsecondary contexts are provided in a recent meta-analysis by Double and McGrane (2020). Double and McGrane (2020) propose that within existing literature, two main educational benefits are associated with peer assessment. First, student learning of course materials is supported by comparing work with others, which aids learners in identifying gaps in their understanding (Topping, 1998). Second, there is a positive association between peer feedback and academic performance, where peer assessment has the potential to be more efficacious in supporting grade achievement than formative feedback.
from teachers. Peer assessment may help students better comprehend feedback they receive on their work because their peers often use language in their comments that are more familiar and accessible to them (Liu et al., 2016). However, Double and McGrane (2020) state that such educational benefits are often contingent on several main theoretical moderators, which they describe as the degree of anonymity of students (e.g., Rotsaert et al. 2018; Yu & Liu, 2009), scaffolding (e.g., Panadero & Jonsson, 2013), quality and timing of feedback, and elaboration of feedback (e.g., Gielen et al., 2010b).

Several peer assessment taxonomies have been developed by scholars. Chi (1991) developed a seminal peer feedback categorization framework consisting of corrective feedback (i.e., resolving errors based on idealistic solutions), didactic explanations (i.e., long form explanations for incorrect work), suggestive feedback (i.e., probing to redirect thinking patterns) and reinforcing feedback (i.e., reinforcing what was done correctly). Ching and Hsu (2013) developed a categorical feedback coding model based on a scheme created by Lu and Law (2011), organizing codes by affective and cognitive feedback. Affective feedback is primarily praising in nature, whereas cognitive coding is reserved for more critical feedback. Affective category codes include support (i.e., reassuring and encouraging the recipient) and personal experience (i.e., sharing a personal reflection with the recipient). Cognitive category codes include problem identification (i.e., acknowledging an issue with the recipient’s work), question (i.e., inquiring on the recipients’ work), or suggestion (i.e., proposing a solution to improve the recipient’s work). Within the cognitive category, the model also includes additional codes when students elaborate on their original comments. Explanation-learning comments involve peers explaining their feedback by integrated course-related knowledge, while
Explanation-personal includes feedback where assessors elaborate based on their own personal experiences.

**Online Peer Assessment**

With the continued growth of online learning environments, peer assessment is increasingly administered online (van Popta et al., 2017). As a formative assessment aid, online peer assessment is viewed by scholars as offering several benefits for both educators and students. First, it can significantly reduce the administrative burden other formative assessment methods can place on educators (Tannacito & Tuzi, 2002). Second, online peer assessment offers the benefits of anonymized assessment and freedom of time and space which has been shown to improve student learning and engagement (Tsai et al., 2001, Wen & Tsai, 2006). However, van Popta et al. (2017) suggest that while traditional peer assessment and online peer assessment are relatively similar in terms of supporting cognitive processes required to evaluate peer work, it is unknown whether online peer assessment is more efficacious than traditional peer assessment in supporting social processes such as collaboration (Double & McGrane, 2020).

When administered within student teams, intrateam online peer assessment has typically been structured to allow students to assess the relative contributions of their teammates after work has been submitted. Research indicates that this practice can help to improve team performance and reduce interpersonal conflict (Heslop, 2017). In this study, my intention is to examine how postsecondary students experience and use online peer assessment as a means of advancing collaborative creative thinking within teams.
Chapter 2

Literature Review

As discussed in Chapter 1, to prepare learners for the workplace where critical skills are highly demanded by employers, postsecondary institutions bear a responsibility of supporting the development of creative thinking and collaboration skills in students. Within higher education, resources must be made available that allow educators to instill in their students the capacity to work in teams to creatively solve problems. To accomplish this, an investigation into literature surrounding group-based creative thinking, both in and outside of the classroom, is required. This chapter begins with investigating contemporary literature surrounding creative thinking in educational settings, leading into broader research investigating the mechanisms and interfaces associated with collaborative creative thinking within both workplace and educational contexts. As the aim of this thesis is to explore the efficacy of using online peer assessment to support collaborative creative thinking in postsecondary students, a review of educational literature surrounding traditional peer assessment and online peer assessment associated with individual and group-based creativity is also provided.

Creative Thinking in Education

Empirical research shows that students often require educational supports that aid in stimulating creative thought and idea development. In a study comparing individual working professionals with students, Kilgour and Koslow (2009) examined the effects of divergent thinking tasks on creative ideation processes. Findings indicated that while creative ideation was enhanced for some working professionals, it was limited for students. The researchers suggested that unlike trained professionals, students’ lack of
knowledge of divergent thinking may have contributed to such limitations. Van de Kamp et al. (2015) examined the positive effects of explicit instruction in arts education, showing that when providing instructional support for building metacognitive knowledge of divergent thinking, individual students’ fluency and flexibility of ideas improved.

In terms of creative thinking in student teams, Ostrowski et al. (2020) examined creative processes in a biomedical engineering course. By observing five teams, the researchers discovered that the generation, development, and selection of ideas were most influenced by course-related factors. These factors included course structure (i.e., grading policies, deadlines, schedule), students’ focus on satisfying grading requirements, use of creative ideation support tools, feasibility of ideas related to design and user requirements, and the influence of feedback from experts. The findings suggested that student teams may benefit from a more scaffolded approach, emphasizing the need for instructors to put supports in place that allow teams to act out creative ideation in separate phases (i.e., idea generation, evaluation, selection).

**Collaborative Creative Thinking in Education**

Emerging literature examining the link between PjBL, PBL and creative thinking shows that when given the proper tools, students can enhance their creative thinking abilities as they work in groups, both in traditional and virtual/online learning environments. Wijayati et al. (2019) investigated the impact of PjBL on students' motivation to think creatively in the context of in-person learning. To stimulate creative thinking, participants were given a design project and participated in group conversations about product tools and components. Through analysis of observational and survey data, findings showed that fluency, flexibility, originality, and elaboration of ideas improved
throughout the project lifecycle. While participants may have struggled to think creatively at first, as they gained confidence in sharing ideas and learning from others, their performance improved over time. However, due to the complexity of the work and the disparity in abilities among groups, some participants lacked motivation, which may have limited their ability to present their creative ideas to peers. Alternative approaches supporting creative ideation processes, particularly during the initial stages of team projects, were not discussed in the study. Chen et al. (2019) found that when working in teams, engineering students’ creative thinking fluency and flexibility improved using PjBL when compared with lecture-based teaching strategies. While creative thinking was taught during class time for the control group, participants in the experimental group learned about creative thinking asynchronously via remote learning modules, where class time was instead dedicated to in-person lab experiments, group discussions and creative thinking activities. To buttress collaborative creative ideation for teams, the researchers used a guided questionnaire based on the SCAMPER creative thinking model (Eberle, 1996). While in general, participants favoured the use of the model, the researchers did not examine differences in how teams moved through their creative ideation processes to arrive at their project designs.

Ersoy (2014) examined the effects of PBL on the creative thinking abilities of undergraduate statistics students. Participants were organized into an in-person problem-based study group. Pre-and post-test survey results indicated that the experience had a positive effect on students’ creative thinking, possibly due to their exposure to a variety of viewpoints and changing perspectives, as well as hypothesizing solutions through group brainstorming. However, change in creative fluency, which the researchers defined
as the ability to produce and evaluate new ideas, was not significant. The researchers suggested that future studies should examine creative thinking by using other formats over extended time periods. Winarno (2018) found that when PBL was used as a substitute for direct instruction, creative thinking and teamwork skills improved. Unlike control group teams that received only lectures, participant teams in the PBL group were given scaffolded virtual learning environments on the creative thinking of engineering student teams. Teams were given problems and were tasked with arriving at solutions using both physical labs during class and virtual labs outside of class time. For each problem, teams were given a notebook to document their creative ideation processes. Data from team notebooks were triangulated with interview transcriptions and project deliverables. Findings showed that while teams did not arrive at higher quality solutions in virtual environments, divergent thinking increased. Some participants suggested that the virtual labs were more open-ended, which may have stimulated the need for greater divergent thinking. A limitation of the study was that collaborative creative thinking was measured indirectly through outputs of creative ideation rather than processes. Specifically, the researchers examined artifacts captured during team activities, but did not explore the actual direct interactions that took place among team members.

Villanueva et al. (2011) explored the positive effects of PjBL on collaborative creative thinking when online ideation tools were used to form student teams. Participants were instructed to generate possible project ideas using online wikis, where ideas were anonymized and then evaluated by peers. Teams were formed by matching participants’ evaluation scores for the same ideas as well as degree of fluency and elaboration of ideas. The findings suggested that the use of online creative ideation tools
supported idea generation and originality, with participants holding positive perceptions of the use of such tools, which they felt supported their generation, communication, and evaluation of project ideas.

**Electronic Brainstorming**

Research examining work teams indicates that groups are best supported when members share and build on each other’s ideas using electronic brainstorming, which may help reduce the social and cognitive issues associated with traditional brainstorming. Dennis and Valacich (1993) discovered that the anonymity provided by electronic brainstorming increased the fluency of ideas, likely because members may have been less hesitant to evaluate the ideas of others when their identities were protected. Nijstad et al. (2003) ran several experiments based on the SIAM model that simulated production blocking, showing productivity loss in idea generation when the onset, predictability and length of delays were controlled using electronic brainstorming. The researchers suggested that to avoid the cognitively disruptive effects of turn-taking, teams should incorporate electronic brainstorming into their creative ideation efforts.

While electronic brainstorming holds promise, research suggests that its effects are not absolute, and as such, it should be carefully structured to allow for effective collaboration among team members. Paulus et al. (2013) examined how individual creative ideation was influenced by participants being exposed to many ideas using electronic brainstorming without any peer-to-peer interaction. Participants were given an open-ended problem, where they brainstormed solutions on computers in isolation while being knowingly exposed to computer-generated ideas, but not the ideas of their peers. Findings showed that participants’ fluency of ideas increased, possibly because they were
able to build a foundation of exposed ideas leading to further creative exploration. However, originality of ideas did not improve until later in the session. The researchers recommended that for electronic brainstorming to be most effective in teams, instead of exposing individuals to ideas sequentially, ideas should first be pooled and then shared so that members are motivated to build on rather than hastily conform to each other's ideas.

In a 2016 study, Baruah and Paulus explored how team members ideas were impacted once common or unoriginal ideas had been exposed using online electronic brainstorming. During a creative ideation activity, team members engaged in interactions where they were able to view each other’s ideas. Findings showed that teams had higher fluency and produced more original ideas relative to teams with no such interaction, where originality significantly waned over time. As a limitation of the study, the researchers did not examine the effects of more advanced interactive elements such as comments and feedback among members, and how such interactions might shape ideas throughout the creative ideation process. Furthermore, the study was based on a 15-minute brainstorming session, and thus the effects of longer-term creative ideation activities were not explored.

Al-Samarraie and Shuhaila (2017) conducted a meta-analysis of 42 studies focusing on brainstorming techniques in higher education. As consistent with Nijstad et al. (2003), the researchers found that electronic brainstorming can reduce production blocking within educational settings as it requires students to rely on fewer social and cognitive resources than more traditional forms of brainstorming. In their examination of the literature, electronic brainstorming was assumed to support more idea sharing, as students may feel more comfortable expressing themselves when their identities are
unknown. Furthermore, Al-Samarræie and Shuhaila (2017) found that electronic brainstorming can assist in further idea development since ideas can be documented and stored, allowing students to refer to them at any time. The meta-analysis showed that electronic brainstorming can have direct educational benefits such as supporting peer learning, knowledge acquisition, student participation rates in online discussions, thought organization and achieving group consensus-building. However, limited studies were cited that focused specifically on the role of peer assessment in the development of ideas through electronic brainstorming. While the researchers did mention a study by Roy et al. (1996) that examined peer feedback through electronic brainstorming, the study focused on reducing social loafing / freeloading effects in student groups rather than investigating the relationship between online peer assessment and the advancement of ideas within student groups.

**Online Peer Assessment**

When working on and evaluating projects, students tend to employ and respond to the various forms of online peer assessment in different ways. Using the peer feedback categorization framework from Chi (1996), Tseng and Tsai (2007) found that suggestive and reinforcing feedback were most beneficial in the early stages of project development, whereas didactic and corrective feedback may have been detrimental in the later phases. Wuttisela et al. (2016) examined student perceptions of using online peer assessment in project-based learning (PjBl) environments and differences in reflections of assessments between teachers and students. Results indicated that when given a structured rubric, most students preferred giving suggestive feedback when assessing projects, whereas teachers emphasized reinforcing feedback. Ching and Hsu (2013) explored graduate
students’ peer feedback after they posted draft copies of key project deliverables using online discussion boards. Using an open-ended survey, results showed that most participants held positive perceptions of online peer assessment in this environment, perceiving that giving and receiving peer feedback supported a more scaffolded approach to project work that reduced anxiety and made the work more enjoyable. The researchers also used content analysis to code feedback using a coding scheme originally developed by Lu and Law (2011). Findings indicated that where participants used their real names, they were most supportive of their peers and avoided harsh criticism, often using disclaimers and gentle language in their critiquing. Where participants were anonymized however, negative comments and irrational emotions were rare but more frequent. The researchers also experimented with the structure of the discussion board activities. Frequency of problem identification, suggestion, explanation-personal and support feedback increased when a guided assessment question was integrated into the discussion board activity, whereas explanation-learning and personal experience decreased. The researchers suggested that in the absence of clear instructions or prompts, such feedback patterns may have resulted from students relating to their own lived experiences instead of newly learned concepts, indicating that guided questions during online peer assessment exercises may enhance student learning. While the research did explore feedback trends using online peer assessment, it did not focus specifically on creative thinking or group work.

In terms of online peer assessment utilized within student teams (i.e., intrateam online peer assessment), research has mostly focused on member-to-member evaluations of task performance rather than assessment of work (e.g., Donia et al., 2018; Dumand &
Galaleldin, 2020). As the purpose of this study is not to examine team behavioural aspects but instead to explore cognitive creative processes related to group idea generation, these studies are not discussed in further detail.

**Peer Assessment Supporting Creativity**

According to research, peer assessment can help students build creative thinking skills. However, because peer assessment is not intuitive for most students, additional supports are often required. Beaman (1990) studied the use of peer assessment in advertising students’ creative work, finding that peer assessment fostered a creative climate as students re-orientated from competitors to co-operators in learning. To avoid resistance to peer assessment, the researcher suggested that students should have adequate training and practice giving and receiving feedback so that peer assessment becomes a more natural approach to learning. Brill (2016) looked at the creative effects of peer assessment on student teams, finding that most participants did not find peer assessment had an impact on their creative work in instructional design projects. The researcher suggested that for peer assessment to be most effective, activities should be structured in smaller, low-threat increments, with scaffolded resources provided to assessors, including the use of creativity rubrics.

**Online Peer Assessment Supporting Creativity**

Interestingly, online peer assessment appears to share common characteristics with electronic brainstorming, including the ability to anonymize participants, submit, pool, and share work. Unsurprisingly, research suggests that facilitating peer assessment by using online tools may help provide the necessary social and cognitive aids that often benefit students in their creative efforts. Cheng and Tsai (2012) examined the positive
impact of online peer assessment in supporting student exploration of the ideas of peers. Most student participants (82 percent) felt that social networks and friendships were maintained by using anonymous online peer assessment, promoting security in providing richer feedback towards peers. Amhag (2013) explored how peer feedback and comments in online discussion boards helped learners develop creative thinking skills. Content analysis was conducted on 155 text-based items from the discussion boards taken from a sample of 22 student teachers enrolled in a distance teacher training program. Themes and patterns were exposed from analysis of peer feedback and comments related to course work. Results indicated the potential for learners to develop creative thinking skills through online collaboration with peers, reciprocating peer feedback, and conducting self-assessments (Dickhut, 2006). Chang et al. (2019) explored the relationship between online peer assessment and creativity. Findings showed that when learning through a creative activity with an added online peer assessment component, student creative tendency improved. The researchers suggested that students were more engaged with perfecting their creative work and encouraged to learn and reflect because they could comment and provide suggestions to peers. While results were not statistically significant, the researchers noted that the limited duration of their experiments may have reduced the creative exploration of participants, suggesting that projects with longer life cycles may allow for greater creative exploration.
Chapter 3

Method

Methodology

As the intention of this thesis was to provide a deeper, holistic account of the research, I strived to not only measure participant perceptions of creative experiences, but to capture and explore what took place during those experiences. As such, my investigation was divided into three research questions: the first with a quantitative focus (how do student perceptions of the effectiveness of collaborative creative thinking using online peer assessment vary between student teams?), the remaining two with a qualitative focus (through online peer assessment, what kinds of feedback do team members provide on the creative ideas of their teammates? and how does online peer assessment appear to influence the creative ideation process in teams?). The first research question required a method of measuring perceptual responses from students after they participated in a creative ideation activity facilitated through an online peer assessment platform. The second and third research questions called for a means of interpreting and describing nonnumeric data collected during the activity. To meet these requirements, an explanatory sequential mixed method was deemed most appropriate. This pragmatic research approach is used when researchers seek to explain and draw conclusions about quantitative data through qualitative techniques (Privitera & Ahlgrim-Delzell, 2019).

It should be noted that while the study used procedures resembling an experiment, it did not meet the necessary conditions to be categorized as such. Although I had a high degree of control over the research setting, the study did not have a control group or utilize methods by which participants were randomly assigned. Furthermore, none of the
research questions sought to directly demonstrate cause and effect. Therefore, under these conditions, it is appropriate to describe this mixed methods research as quasi-experimental in nature (Privitera & Ahlgrim-Delzell, 2019).

**Quantitative Methodology**

I selected a one-group posttest-only design for the quantitative portion of the study. This approach uses methods that measure a dependent variable for a single group of participants following a treatment (Privitera & Ahlgrim-Delzell, 2019). As all participants experienced the same treatment (i.e., a team-based activity), this design was deemed most appropriate for answering the first research question, which required a means of measuring participant perceptions of how effectively online peer assessment supported their team’s creative thinking during the study.

**Qualitative Methodology**

According to Privitera and Ahlgrim-Delzell (2019), empiricism is used by researchers to gain knowledge through observations and experiences, while rationalism presupposes that knowledge is gained through the application of reason and logic. I used a combination of both empiricism and rationalism as the epistemological basis for drawing conclusions about the qualitative dataset. It is the combination of these two methods of knowing that guided my methodological choices and resulting analysis.

A case study is a qualitative research methodology with the purpose of providing an in-depth examination of a bounded focus of study, known as a *case* (Privitera & Ahlgrim-Delzell, 2019). The specific design I selected for the qualitative portion of the study was a collective case study, which “compares the individual analysis of related cases” (Privitera & Ahlgrim-Delzell, 2019, p. 321). I selected this methodology for
addressing the second and third research questions because both focused on exploring and comparing patterns and trends in the qualitative dataset at the team-level. While all participants in the study were assigned to different teams, teams were related in the sense that they experienced the same activity at the same time.

**Ethical Clearance**

As an educational researcher, it was my responsibility to ensure that my work met the highest standards of research ethics. This included treating participants as autonomous agents who receive fair and equal treatment, and mitigating any potential risks introduced by the study (Privitera & Ahlgrim-Delzell, 2019).

The study took place at the University of Toronto Scarborough, with Dr. Steve Joordens, a faculty member in the Department of Psychology, designated as a principal investigator. Dr. Joordens applied for ethics clearance which was granted by the University of Toronto Scarborough. On the ethics application, I was specified as a collaborator. Participant consent took the form of both an information letter and consent form which conformed to all requirements set forth by the University (Division of the Vice-President, Research & Innovation, n.d.).

I applied for ethics clearance through the Education Research Ethics Board (EREB) at Queen’s University, my home institution. My participation in the study was classified as secondary analysis by Queen’s University. To ensure compliance with the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans – TCPS 2 (2018), I was required to complete the Course on Research Ethics (CORE) (Queen’s University Faculty of Education, n.d.). To be granted access to the dataset collected by Dr. Joordens required a data transfer agreement (TFA) to be created and signed by
representatives from both institutions. Prior to receiving the dataset, all data strands were anonymized. Copies of all ethics clearance documentation are included in Appendix A.

Methods

Sample

Participants were students enrolled in two introduction to psychology courses at the University of Toronto Scarborough (N=55). Students received up to four percent credit in their course for their participation in the study, which aligned with program policy (S. Joordens, personal communication, April 8, 2021). As participants were students in a higher education setting engaging in the specific learning processes under focus in this study (i.e., collaborative creative thinking through online peer assessment), sampling was considered purposeful. This sampling method is commonly used when researchers require selecting participants with specific characteristics or experiences (Privitera & Ahlgrim-Delzell, 2019). Because students were selected based on their choice to participate to receive credit, sampling was non-probabilistic and therefore non-random.

Participant Recruitment and Selection

Participants were recruited via self-enrollment through University of Toronto’s SONA system. SONA allows researchers who conduct experiments with human participants to recruit students from two psychology courses at the university (University of Toronto Scarborough Department of Psychology, n.d.). The recruitment process was facilitated by Dr. Steve Joordens, who along with being a faculty member at the University of Toronto Scarborough at the time of the study, was also a collaborator on
this thesis project. All participants who self-enrolled through the SONA system were selected to participate in the study.

**Instrumentation**

The activity was conducted over two and a half hours over Zoom. Participants were organized in groups and were instructed to move through a structured collaborative activity using peerScholar—a leading, fully digital online peer assessment platform. Following this process, participants were asked to complete an interactive questionnaire administered through peerScholar. This questionnaire was designed to measure how effective participants felt online peer assessment was in supporting their team’s creative during the activity.

**peerScholar.** It is my belief that the peerScholar platform was the ideal instrument for this study. While typically used to facilitate peer-to-peer feedback of formative work, many of the platform’s features align well with the seminal literature surrounding best practices for supporting team-based creative thinking and ideation (e.g., Nijstad & Stroebe, 2006; Ostrowski et al., 2020; Paulus & Brown, 2007). This includes the ability to gate the creative ideation process within phases and anonymizing team members for all communications. Relative to other creative ideation methods prone to interactivity lags (e.g., traditional brainstorming), the platform also offers the potential to limit delays in communication, as peerScholar “tends to reduce the time between creating academic work and receiving feedback” (University of Toronto Scarborough, n.d., para. 3).

The native structure of the peerScholar platform consists of three separate phases. In the first phase (*Create*), students typically produce or upload copies of their draft
work. In the second phase (*Assess*), students provide feedback on the work of their peers. In the third phase (*Reflect*), students review feedback received, revise, and submit their final work. Within each phase, the platform allows for the integration of scaffolded learning components. In this study, all aforementioned features were leveraged with the inclusion of idea generation and feedback training materials to support participants throughout the online peer assessment process.

**Instrument Design.** The team-based creative ideation activity facilitated through peerScholar was divided into four parts. After receiving a verbal debriefing, participants were given a team-based open-ended problem to brainstorm, where upon entering peerScholar they: (1) individually generated project ideas related to the given open-ended problem and anonymously shared their ideas with their teammates; (2) reviewed the ideas of their fellow teammates and provided feedback; (3) submitted their final project ideas after receiving feedback on their originally submitted ideas; and (4) were exposed to a pool of all final ideas shared within their teams. Text-based instructions were included in peerScholar for each of the four parts of the activity. Figure 1 below illustrates the process flow of the activity. Complete copies of the open-ended problem and instructions provided for each part of the activity are included in Appendix B.
Survey Instrument. An interactive questionnaire was administered in peerScholar directly at the end of the activity, with participants able to go back and forth reviewing the pool of ideas and the questionnaire. The questionnaire used Likert scale rating levels of agreement from 1 (strongly disagree) to 5 (strongly agree). Four survey items were included in the questionnaire that integrated the verbal Torrance Tests of
Creative Thinking (TTCT) (Torrance, 1974). I believed the verbal TTCT to be the most appropriate basis for the survey, as it is largely centered on creative ideation and problem solving as a measure of creative thinking (Torrance, 1974). The four survey items consisted of questions designed to measure the degree to which participants perceived online peer assessment to be effective at supporting their team’s creative thinking during the activity. Each question focused on one of the four dimensions of the verbal TTCT (i.e., fluency, flexibility, originality, and elaboration). The questionnaire items are shown in Table 1 below.

Table 1

Survey Items Based on TTCT (Torrance, 1974)

<table>
<thead>
<tr>
<th>Intended construct</th>
<th>Torrance Tests for Creative Thinking (TTCT) Scale (Torrance, 1974)</th>
<th>Survey question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluency</td>
<td>The number of ideas generated</td>
<td>Using Online Peer Assessment was effective in supporting my team to generate a large number of project ideas.</td>
</tr>
<tr>
<td>Flexibility</td>
<td>The degree of diversity of ideas generated</td>
<td>Using Online Peer Assessment was effective in supporting my team to generate a wide variety of project ideas.</td>
</tr>
<tr>
<td>Originality</td>
<td>The level of distinctiveness among ideas generated</td>
<td>Using Online Peer Assessment was effective in supporting my team to develop project ideas that were interesting and unique.</td>
</tr>
<tr>
<td>Elaboration</td>
<td>The level of depth or richness of ideas generated</td>
<td>Using Online Peer Assessment was effective in supporting my team to develop detailed, high quality project ideas.</td>
</tr>
</tbody>
</table>

Data Collection Methods

Both quantitative and qualitative data strands were collected entirely through each team’s private channel within peerScholar. The qualitative dataset consisted of all text-based interactive data captured during parts 1 through 3 of the activity, while data collected from the interactive questionnaire made up the quantitative data strands.
**Data Collection Modifications.** The activity took a total of three passes until the collected data could be considered usable for the purpose of quantitative and qualitative analysis. For all passes, participants were randomly assigned to teams of four, which fell within the optimal range for team-based brainstorming (Renner, 1997). For all passes, participants had previous experiences using peerScholar in their course work and had some prior exposure to the microlearning scaffolding videos provided on the peerScholar website (S. Joordens, personal communication, December 12, 2022).

The first pass of the activity took place over the course of a week during the later portion of the fall 2021 semester. Each day, participants were required to log into peerScholar remotely and were given instructions and reminders by Dr. Steve Joordens over email. Dr. Joordens was also the lead instructor of an introduction to psychology class the participants were enrolled in. As students were already working on a team assignment in the class, my intention was to provide a more naturalistic research setting by organizing the participants into their class teams. Due to the native architecture of peerScholar, the activity needed to be broken into two separate sections. For both sections, participants were required to self-enroll into a numbered team created in advance. Teams were numbered using the same identifier as the ones students had been assigned in their class. While unforeseeable at the time, this added level of complexity may have led to environmental factors that posed a threat to the validity of the collected data. Upon reviewing the dataset, I discovered that the process fell apart; most participants ending up self-enrolling in a different team when entering the second section. As a result, the dataset from this pass was unusable for the purpose of the study.
To avoid previous errors, a second pass of the activity took place during the winter 2022 semester, with far fewer student participants recruited. To improve research environmental factors, instead of allowing participants to self-enroll, each student was randomly assigned to a team. There was no attempt to link participants to their course teams as there were no team class assignments during this period. While this approach eliminated team formation issues, 60 percent of participants did not complete the final phases of the activity, making data between teams uneven. This created a potential threat to the internal validity of the study through heterogenous attrition. According to Privitera and Ahlgrim-Delzell (2019) this form of attrition “occurs when attrition rates in one group are more or less than attrition rates in another group” (p. 204). Given these conditions, data from the second pass was not used.

A third and final pass was completed during the spring 2022 semester. To control for attrition rates experienced in the second pass, instead of having participants complete the activity asynchronously spread out over one week, the activity was conducted live and supervised over two and a half hours on Zoom. As with the second pass, no class teams existed, and participants were randomly assigned to teams as they logged into the live session. Based on previous empirical research suggesting students may need advance training and support before engaging in collaborative creative thinking activities (Chen et al., 2019), to control for potential disorientation with the requirements of the activity, participants were given a short briefing on the underlying concepts surrounding both online peer assessment and creative ideation. They were also given verbal instructions before each stage of the activity. Text-based instructions for each part of the activity were also included directly in peerScholar. Throughout the entire process, participants were
able to clarify and ask questions over Zoom. This significantly improved participant engagement and resulting attrition rates, and thus the dataset collected from the third pass was used.

**Analytical Procedures**

*Research Question 1: How do student perceptions of the effectiveness of collaborative creative thinking using online peer assessment vary between student teams?*

Measuring internal consistency of quantitative data prior to analysis is a common technique to measure the degree to which variables in a test measure a single construct (Tavakol & Dennick, 2011). It is most often calculated using Cronbach’s alpha, which Tavakol and Dennick state is “the most widely used objective measure of reliability” (p. 53). To calculate Cronbach’s alpha to measure the degree of internal consistency of the survey data across all four questions, I conducted reliability tests using IBM SPSS Statistics Version 28.0.1.1. Results are presented in Chapter 4 of the study.

To determine the degree to which teams perceived how well their creative thinking was supported using online peer assessment, descriptive statistical analysis was used. For each team I averaged scores across all four questions. I also developed a rating system to provide a nominal classification for the degree to which teams varied in their perceptual scores. Teams with mean scores of 1 to 2.3 were categorized as low, teams with mean scores from 2.4 to 3.7 were categorized as moderate, and teams with mean scores of 3.8 and up were categorized as high.

Because student teams were treated as comparative cases, they were also defined as the unit of study for this thesis. This approach was consistent with past literature exploring team-based peer evaluation and collaborative creativity (See e.g., Baer, 2008;
Loughry, 2014). As stated by Smith et al, (2014), by using interrater agreement, “researchers make determinations of whether data measured at the individual level of analysis can be aggregated for use at a higher (e.g., work group or business unit) level of analysis” (p. 239). Therefore, to justify aggregating participant scores to the team-level, I used the within-group interrater agreement (IRA) index $r_{WG}$ developed by James and Wolf (1984). The $r_{WG}$ index compares “the observed variance in ratings furnished by multiple judges of a single target to the variance one would expect when the judges responded randomly” (p. 825). I used the following formula to calculate interrater agreement (IRA) within each team: $r_{WG} = 1 - (S_{X}^2 / \sigma^2_E)$, where $S_{X}^2$ represented the observed variance (i.e., variances of perceptual scores) on variable $X$ (i.e., team association) taken over $K$ judges (i.e., participant team members), and $\sigma^2_E$ represented an expected variance based on a random, complete lack of agreement between team members (LeBreton, & Senter, 2008). As is common practice in reporting of $r_{WG}$ (Ginsburg et al., 2016), I assumed that random response was uniformly distributed (i.e., $\sigma^2_E = 2.0$). Calculations were facilitated in IBM SPSS Statistics Version 28.0.1.1 using syntax developed by LeBreton, & Senter (2008). This syntax calculated the observed variances within each team across all four raters (team members) based on the mean perceptual scores for each team member. The results of the calculations are found in Chapter 4.

**Research Question 2:** Through online peer assessment, what kinds of feedback do team members provide on the creative ideas of their teammates?

To address this research question, by means of a collective case study design I used content pattern analysis, which helps describe similar actions and behaviours that
can be considered manifestations of the same thing (Patton, 2014). Treating each team as a separate case, I analyzed interactions within teams to help discover common and diverging characteristics in how team-mates provided feedback on the initial ideas shared by their teammates. To develop descriptions of patterns observed from this analysis, I coded the data captured during Part 2 of the activity using a quasi-inductive approach, which allows researchers to first examine data using theory-derived concepts and then “look at the data afresh for undiscovered patterns and emergent understandings (i.e., inductive analysis)” (Patton, 2014, p. 543).

**Coding Framework.** While pulling from elements of Chi’s peer feedback categorization framework (1991) the coding framework I developed was largely based on Ching and Hsu’s online peer feedback scheme (2013). (See Table 2.) I selected this scheme as the basis for my coding framework because of its focus on specific kinds of peer feedback in online learning environments, which fit best within the context of this thesis. I coded the entire dataset using NVivo 12.

**Coding Framework Modifications.** The original coding scheme by Ching and Hsu (2013) was based on a study in a natural setting examining types of feedback students provided to their peers in an online course. However, my study was not integrated into a course, and participants were not collectively learning and giving formative feedback on their course work. Thus, the data collection environment may be considered somewhat contrived, defined as a research setting “that is arranged or manipulated to appear the same as the natural environment within which a behavior of interest naturally occurs” (Privitera & Ahlgrim-Delzell, 2019, p. 223). It was therefore appropriate to make modifications to certain naming conventions and definitional
terminology within the scheme to fit the context of the research environment and the creative ideation activity under investigation in this thesis.

After quasi-inductive coding of all 40 participants within all 10 teams, a total of two coding categories featuring 11 subcategories emerged. Within the cognitive category, naming conventions for problem identification, suggestion, and explanation-personal subcategories remained unchanged, while explanation-learning was altered to explanation-subject matter. After qualitative analyses of the dataset, several additions were made. To add nuance, I broke the question subcategory into four main feedback types: clarifying question, leading question, provoking question, and rhetorical question.

Within the affective category, personal experience remained intact while I renamed support feedback as supportive as I believed it to be a more suitable descriptor. In their use of Chi’s peer feedback categorization framework (1996), Tseng and Tsai (2007) partially described reinforcing as feedback students receive from peers where they “may be encouraged without explicitly knowing the reasons” (Tseng & Tsai, 2007, p. 1168). While this kind of feedback was already accounted for under the supportive subcategory, I discovered occurrences where participants also provided elaboration on the positive praise they gave to their teammates. As no subcategory existed to code such feedback in the original Ching and Hsu (2013) scheme, I repurposed Chi’s original terminology (1996) to create a new subcategory explanation-reinforcing.

The final framework, titled the intrateam creative ideation feedback framework, is included in Table 2 below, which includes the original coding scheme by Ching and Hsu (2013) with my revisions and additions. It is this final framework I used to code the qualitative interactive dataset captured in Part 2 of the activity.
<table>
<thead>
<tr>
<th>Original category</th>
<th>Original definition</th>
<th>Revised category</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive Problem identification</td>
<td>Addressing specific issues</td>
<td>Cognitive Problem identification</td>
<td>Addressing specific issues or challenges with an idea</td>
</tr>
<tr>
<td>Question</td>
<td>Asking questions to clarify or to prompt deeper thinking</td>
<td>Clarifying question</td>
<td>Asking a specific question to confirm or understand details of an idea</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leading question</td>
<td>Asking a suggestive question to lead the recipient towards a given line of thought</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provoking question</td>
<td>Asking a question that presents an open-ended challenge to stimulate creative thought</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rhetorical question</td>
<td>A statement about an idea phrased as a question where an answer is not required</td>
</tr>
<tr>
<td>Suggestion</td>
<td>Providing a method to deal with the problem</td>
<td>Suggestion</td>
<td>Providing a method to deal with an identified problem</td>
</tr>
<tr>
<td>Explanation Learning</td>
<td>Learning content-related elaboration or justification on the problems identified/suggestions/questions</td>
<td>Explanation</td>
<td>Providing content/topic-related opinion, elaboration, or justification on the problems identified/suggestions/questions</td>
</tr>
<tr>
<td>Explanation Personal</td>
<td>Personal-experiences-related elaboration or justification on the problems identified/suggestions/questions</td>
<td>Explanation</td>
<td>Providing personal anecdotal experience-related elaboration or justification on the problems identified/suggestions/questions</td>
</tr>
<tr>
<td>Affective Support</td>
<td>Praising the work or expressing positive comments on the ideas</td>
<td>Affective Supportive</td>
<td>Expressing agreement or positive praise for an idea without providing elaboration or justification</td>
</tr>
<tr>
<td>Personal experience</td>
<td>Sharing relevant personal information or experiences for support or social exchange</td>
<td>Personal experience</td>
<td>Sharing relevant personal information or experiences related to an idea for the purpose of offering support or social exchange</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reinforcing</td>
<td>Providing content/topic-related elaboration or justification on supportive feedback</td>
</tr>
</tbody>
</table>
Research Question 3: How does online peer assessment appear to influence the creative ideation process in teams?

I explored changes within teams in two parts, using a combination of quantitative and qualitative analytical methods. I approached the quantitative side empirically, using the fluency and elaboration constructs of the verbal TTCT in my examination of the data captured during Part 1 and Part 3 of the activity. I quantified these constructs using a frequency method, described by Privitera and Ahlgrim-Delzell (2019) as an observational approach “used to qualify observations made in a study by counting the number of times a behavior occurs during a fixed or predetermined period of time” (p. 227). For fluency, I tallied the number of ideas generated and initially shared within teams and compared these counts with the number of ideas shared after participants moved through the feedback process during Part 2 of the activity. I took a similar approach to measure elaboration, instead comparing wordcounts of ideas. Wordcounts are often included in online peer assessment application dashboards as indicators of depth and richness of content. As participants articulated their ideas using text-based descriptions through peerScholar, I deemed wordcount to be an appropriate measure of the elaboration construct. Because the two remaining elements of verbal TTCT, originality and flexibility, were not easily quantified due to their subjective nature, and because they were already captured in the perceptual survey results, I did not integrate them into this analysis.

On the qualitative side, using collective case study pattern analysis, I treated each team as an individual case and created summaries of how the initial ideas shared within teams changed over the course of the activity. I reviewed the qualitative data collected in
Part 1 of the activity and compared them with the data collected during Part 3, making note of any specific updates or changes to the original ideas that participants had shared within their teams. I also examined the types of feedback participants gave and received to indicate what kind of feedback may have influenced these changes. I then compared cases to determine which observations tended to generalize across teams.
Chapter 4

Results

Of the 54 participants, 14 were removed from the final dataset due to inactivity or because of some attrition occurring within the various phases of the third and final pass of activity. A total of 40 participants \( (n=40) \) divided into 10 teams of four were included in the analysis.

Survey Data Descriptive Statistical Analysis

Internal Consistency

As the first step to answering research the first research question, Cronbach’s alpha was calculated to measure internal consistency of the data via reliability tests using IBM SPSS Statistics Version 28.0.1.1. None of the variables had a zero variance and thus all were included in the test. As per Tavakol and Dennick (2011), Cronbach’s alpha is expressed as a value ranging from 0 to 1, where results between 0.70 and 0.95 are often considered acceptable. Based on results of the reliability tests shown in Table 3, Cronbach’s alpha was in the acceptable range, suggesting internal consistency. Thus, I considered the quantitative data reliable for the purpose of analysis. The questionnaire results are available in Appendix C.

Table 3

<table>
<thead>
<tr>
<th>Cronbach's Alpha</th>
<th>Cronbach's Alpha Based on Standardized Items</th>
<th>No. of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.748</td>
<td>0.749</td>
<td>4</td>
</tr>
</tbody>
</table>
**Differences Between Teams**

To address research the first research question, for each team, I first calculated mean survey scores for each of the four survey items. Then for each team, I averaged the four mean survey scores to arrive at an overall mean perceptual survey score, representing the degree to which participants felt their team’s creative thinking was supported through online peer assessment. Results show Team 1 ($M = 4.5, SD = .50$), Team 2 ($M = 4.8, SD = .60$), Team 3 ($M = 4.5, SD = .70$), Team 4 ($M = 3.9, SD = .70$), Team 5 ($M = 4.8, SD = .70$), Team 6 ($M = 4.4 SD = .60$), Team 7 ($M = 4.0, SD = 1.0$), Team 9 ($M = 4.0, SD = 1.0$) and Team 10 ($M = 4.1, SD = .60$) all had a high score. Only Team 8 ($M = 3.7, SD = .70$), had a moderate score, and no teams had a low score. Results are shown in Table 4 below.

**Table 4**

**Mean Perceptual Questionnaire Scores by Team**

<table>
<thead>
<tr>
<th>Item</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Team 5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>4.5</td>
<td>0.6</td>
<td>4.8</td>
<td>0.5</td>
<td>4.8</td>
<td>0.5</td>
<td>4.0</td>
<td>0.8</td>
<td>4.5</td>
<td>1.0</td>
</tr>
<tr>
<td>SD</td>
<td>4.5</td>
<td>0.6</td>
<td>4.8</td>
<td>0.5</td>
<td>4.8</td>
<td>0.5</td>
<td>4.0</td>
<td>0.8</td>
<td>4.5</td>
<td>1.0</td>
</tr>
<tr>
<td>M</td>
<td>4.3</td>
<td>0.5</td>
<td>5.0</td>
<td>0.0</td>
<td>4.5</td>
<td>0.6</td>
<td>3.3</td>
<td>0.5</td>
<td>5.0</td>
<td>0.0</td>
</tr>
<tr>
<td>SD</td>
<td>4.5</td>
<td>0.6</td>
<td>4.8</td>
<td>0.5</td>
<td>4.3</td>
<td>1.0</td>
<td>4.5</td>
<td>0.6</td>
<td>4.3</td>
<td>1.0</td>
</tr>
<tr>
<td>M</td>
<td>4.8</td>
<td>0.5</td>
<td>4.5</td>
<td>1.0</td>
<td>4.5</td>
<td>1.0</td>
<td>3.8</td>
<td>0.5</td>
<td>5.0</td>
<td>0.0</td>
</tr>
<tr>
<td>SD</td>
<td>4.5</td>
<td>0.6</td>
<td>4.8</td>
<td>0.5</td>
<td>4.5</td>
<td>1.0</td>
<td>4.5</td>
<td>0.6</td>
<td>4.3</td>
<td>1.0</td>
</tr>
<tr>
<td>M</td>
<td>4.5</td>
<td>0.6</td>
<td>4.8</td>
<td>0.5</td>
<td>4.5</td>
<td>1.0</td>
<td>4.5</td>
<td>0.6</td>
<td>4.5</td>
<td>1.0</td>
</tr>
<tr>
<td>SD</td>
<td>4.5</td>
<td>0.6</td>
<td>4.8</td>
<td>0.5</td>
<td>4.5</td>
<td>1.0</td>
<td>4.5</td>
<td>0.6</td>
<td>4.5</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Results based on questionnaire data surveying a total of 40 participants ($n=40$) divided evenly into 10 teams.

Q1, "Using Online Peer Assessment was effective in supporting my team to generate a large number of project ideas."

Q2, "Using Online Peer Assessment was effective in supporting my team to generate a wide variety of project ideas"

Q3, "Using Online Peer Assessment was effective in supporting my team to develop project ideas that were interesting and unique."

Q4, "Using Online Peer Assessment was effective in supporting my team to develop detailed, high quality project ideas"

Mean scores are categorized as follows: Low = 1 to 2.3, Moderate - 2.4 to 3.7, High = 3.8+
Interrater Agreement within Teams

While the questionnaire results helped discover that perceptions of online peer assessment’s support for team-based creative thinking were relatively positive and consistent within teams, these results did not necessarily mean team members shared the same perspectives. To address this, I calculated $r_{WG}$ indices (James & Wolfe, 1984) to measure how consistently perceptions were held within each team. Interrater agreement scores ranged from 0.67 to 0.96. Based on $r_{WG}$ thresholds provided by Smith et al. (2014), agreement was interpreted as being very strong ($r_{WG} >= .91$) within teams 1, 2, 4 and 8, strong within teams 3, 5, 6 and 10 ($r_{WG} >= .71$) and moderate for teams 7 and 9 ($r_{WG} >= .51$). Therefore, it can be said that participant perceptions were shared relatively consistently, and thus within teams, most participant experiences aggregated to a single held belief. Results from the interrater agreement (IRA) calculations are shown in Table 5 below.

Table 5

**Within-Group Creative Thinking Interrater Agreement Indices**

<table>
<thead>
<tr>
<th>Team</th>
<th>Collaborative Creative Thinking</th>
<th>$r_{WG}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
</tr>
<tr>
<td>1</td>
<td>4.5</td>
<td>0.5</td>
</tr>
<tr>
<td>2</td>
<td>4.8</td>
<td>0.6</td>
</tr>
<tr>
<td>3</td>
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<td>0.7</td>
</tr>
<tr>
<td>4</td>
<td>3.9</td>
<td>0.7</td>
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</tr>
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<td>4.4</td>
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</tr>
<tr>
<td>7</td>
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<td>3.7</td>
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<td>1.0</td>
</tr>
<tr>
<td>10</td>
<td>4.1</td>
<td>0.6</td>
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</tbody>
</table>
Text-Based Interactive Data Content Analysis

Peer Feedback Collective Case Study Pattern Analysis

To begin answering research Question 2, I analyzed the complete qualitative dataset captured during Part 2 of the activity where participants provided feedback on the original ideas submitted by their teammates. I began my analysis by first coding all feedback using NVivo 12. Then to highlight peer feedback patterns and trends, I counted coding frequencies within each team. These results are shown in Table 6 below.

Table 6

Peer Feedback Coding Frequencies by Team

<table>
<thead>
<tr>
<th>Categories</th>
<th>Team 1</th>
<th>Team 2</th>
<th>Team 3</th>
<th>Team 4</th>
<th>Team 5</th>
<th>Team 6</th>
<th>Team 7</th>
<th>Team 8</th>
<th>Team 9</th>
<th>Team 10</th>
<th>All</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem identification</td>
<td>8</td>
<td>8</td>
<td>2</td>
<td>9</td>
<td>11</td>
<td>9</td>
<td>9</td>
<td>5</td>
<td>5</td>
<td>9</td>
<td>8</td>
<td>74</td>
</tr>
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<td>4</td>
<td>1</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>1</td>
<td>10</td>
<td>0</td>
<td>24</td>
<td>0.04</td>
</tr>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>5</td>
<td>1</td>
<td>0.01</td>
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<td>1</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>9</td>
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<td>0.05</td>
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<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>6</td>
<td>1</td>
<td>0.01</td>
</tr>
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<td>Suggestion</td>
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<td>14</td>
<td>14</td>
<td>11</td>
<td>19</td>
<td>14</td>
<td>15</td>
<td>3</td>
<td>11</td>
<td>8</td>
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<tr>
<td>Explanation - Subject matter</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>25</td>
<td>0.04</td>
</tr>
<tr>
<td>Explanation - Personal</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>1</td>
<td>0.01</td>
</tr>
<tr>
<td>Overall</td>
<td>37</td>
<td>29</td>
<td>29</td>
<td>32</td>
<td>40</td>
<td>32</td>
<td>23</td>
<td>13</td>
<td>46</td>
<td>17</td>
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</tr>
<tr>
<td>Affective</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supportive</td>
<td>25</td>
<td>24</td>
<td>36</td>
<td>26</td>
<td>36</td>
<td>21</td>
<td>14</td>
<td>13</td>
<td>27</td>
<td>14</td>
<td>236</td>
<td>0.37</td>
</tr>
<tr>
<td>Personal experience</td>
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<td>1</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>3</td>
<td>15</td>
<td>0.02</td>
</tr>
<tr>
<td>Explanation - Reinforcing</td>
<td>13</td>
<td>5</td>
<td>14</td>
<td>15</td>
<td>21</td>
<td>7</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>83</td>
<td>0.13</td>
</tr>
<tr>
<td>Overall</td>
<td>38</td>
<td>30</td>
<td>50</td>
<td>42</td>
<td>61</td>
<td>29</td>
<td>18</td>
<td>14</td>
<td>34</td>
<td>18</td>
<td>334</td>
<td>0.53</td>
</tr>
</tbody>
</table>

Analysis of the results shown in tables 4, 5 and 6 indicates that at the team-level, cognitive feedback forms were coded most frequently for Team 9, which also had a high mean survey score ($M = 4.8$) but the lowest level of agreement between all 10 teams ($r_{WG} = .67$). Affective feedback was coded most frequently for Team 5, which also had the
second highest frequency of cognitive feedback. Furthermore, along with Team 2, Team 5 had the highest mean survey score \((M = 4.8)\) with strong agreement within the team \((r_{WG} = .88)\). Team 8 had the least amount of feedback in both categories, the lowest mean survey score \((M = 3.7)\) but the highest level of agreement \((r_{WG} = .96)\) of all 10 teams. These results suggest that in general, teams that had frequent and varied feedback tended to have more favourable and consistent perceptions of how well online peer assessment supported their creative thinking.

Figure 1 below provides a graphical representation of subcategory coding counts by team. In general, during the activity participants tended to compliment and make suggestions most frequently. The two cognitive subcategories with the highest frequency in nearly every team were problem identification and suggestion feedback. For all teams, explanation-subject matter was coded much more frequently than explanation-personal. Of the four question-based subcategories, provoking question and clarifying question feedback were coded most often, while rhetorical question and leading question feedback were much less common.

Among the three affective feedback subcategories, supportive was by far the most frequently coded, often accompanied by explanation-reinforcing which also occurred in every team, while personal experience was coded only occasionally within six of the 10 teams.
Affective Peer Feedback Patterns. With affective feedback being a popular choice within most teams, a variety of forms within this category were identified. These variations are described below.

Supportive Feedback. It is understood that it is general practice for contemporary researchers to make changes to quotations containing grammatical errors (American Psychological Association, 2020). However, to capture the full nuance of the interactions
that took place during the study, all excerpts taken from the interactive text-based dataset that were included in this thesis are in their original, unedited form.

Participants' high percentage of supportive comments was in line with similar trends presented in online peer assessment research from Ching and Hsu (2013). To illustrate this trend, specific excerpts from the text-based interactive dataset captured through peerScholar are provided below:

These are all very good ideas on how to make people realize the dangers of the disease and let them know the importance of being healthy. (Participant 2B)

I personally don't dislike anything about this idea. (Participant 3D)

Overall, great job, your ideas are very through and detailed, keep it up! (Participant 2A)

At times, supportive feedback also included praising teammates for the way they presented their ideas, as in the following example:

First of all I just wanna complement your style of writing. It was a pleasure reading this and I am sure you probably did not even try lol (Participant 4B)

**Elaborating on Feedback.** While participants did not always justify the supportive feedback they provided, when they did, they would most often do so by reinforcing why they felt peer ideas were effective. In the following instances, participants first offered supportive feedback before elaborating on how the underlying concepts from the ideas helped address societal needs:

I like the idea of making posters because they're more visual and easier to process in a short amount of time. And I think it's a really good idea to create a poster that list the benefits of maintaining mental health. (Participant 1C)

I do appreciate how you mentioned the mental health issue since it has become quite important these days but there are still stigma or stereotypes around these topics. Making sure the right information is being told is very important! (Participant 2B)
Idea 2 is also a great one because people do not always understand everything about this topic. There is so much to talk about. (Participant 3C)

**Sharing Personal Experiences.** As personal experience feedback might be considered more conversational in nature, it is possible it occurred less frequently because participants were not able to directly respond and reply to one another during the activity. However, when students did use this form of feedback, they often did so by reflecting on anecdotal stories and personal insights related to their teammates’ ideas:

I do appreciate how you mentioned the mental health issue since it has become quite important these days but there are still stigma or stereotypes around these topics. Making sure the right information is being told is very important! (Participant 2B)

Expectations of students are so high and I know that if I felt that the feelings and hardships I experience during exam or test time were validated or understood, I wouldn't feel as scared or anxious. (Participant 1D)

I feel like when we see other people's struggles it can remind us that we are not alone. Where we have been challenged with supposedly impossible tasks, there are many others we’ve conquered as well (Participant 9A)

Assessors would also compare their own ideas to those of their peers as a means of sharing personal experiences. The following examples show how participants integrated their own challenges into their feedback:

I appreciate that you have different ads in different geographical locations for people to read and understand, which I hadn't thought of. (Participant 2D)

Makes me realize I should've added alot more detail to mine haha (Participant 5C)

Just three ideas is giving me a headache. (Participant 10D)

This trend also occurred occasionally when students gave cognitive forms of feedback, as seen in the examples below:

I would just suggest elaborating a bit more (but I did not elaborate much on mine either) (Participant 5C)
Cognitive Peer Feedback Patterns. As with affective feedback, cognitive feedback patterns were also identified through content analysis of the complete interactive dataset. Descriptions of these patterns are described below.

Identifying Problems. Consistent with the findings from Ching and Hsu (2013), when participants offered problem identification feedback, they were mostly considerate and tended to avoid unnecessary objections or personal attacks. Often participants led with supportive feedback before addressing the problems they identified with the ideas of their peers. The following examples demonstrate this approach to peer feedback:

While I think eye catching posters are good, bright colours might make it seem like a happy concept. (Participant 6C)

Death from disease is very real and very important, but I think that this approach encourages fear and judgement towards disease rather than taking a compassionate and health-promoting stance. (Participant 2C)

When participants identified problems with ideas without any prior praise or compliments, feedback tended to be objective and direct:

Ideas 4 and 5 are quite bizarre and frankly impractical. (Participant 4A)

I'm not sure idea 1 can help us to improve the social wellness and health. (Participant 10D)

I don't really think that this idea targets the whole concept of personal health and wellness as this idea solely focuses on mental health illnesses. (Participant 5A)

There were also instances where participants identified issues related to how peer ideas were communicated to the team rather than how they were conceptualized. The examples below show how participants noted a lack of detail and questionable language in idea descriptions:

I wish there was more detail as to how we can focus on a specific issue, what specific issue, what steps visually and artistically can we take as a group to promote this idea, etc... (Participant 5A)
I dislike the wording of these ideas, as mental health and wellness are not a "disease" (Participant 2A)

You have described a number of ways of how to get the word out, but the specifics of implementation and purpose are slightly lacking. (Participant 2D)

**Asking Questions.** Provoking question feedback, the most prevalent form of question-based cognitive feedback, typically involved posing open-ended queries that could be answered in multiple ways. Examples of this form of question feedback are shown below:

Any ideas as to how we should use Instagram? (Participant 9A)

What content could you put in a poster or TV ad to best raise people's attention about personal wellness? (Participant 6A)

How will their attention be caught and what will set this account apart from other mental health ones? (Participant 9D)

While problem identification feedback was the common method for participants to express a lack of detail or clarity with peer ideas, similar concerns were also addressed through clarifying question feedback. Going beyond simply stating a concern, this form of question feedback would often address the cause of the concern, generally requiring a direct, yes-or-no, or either-or answer, as shown in the following:

What disease are you referring to? (Participant 2C)

What will the billboard contain? (Participant 3A)

Are we adding fundings, reorganize current fundings, or encourage public donations? (Participant 8B)

Will the government have to increase tax? (Participant 9D)
When problems were identified directly, they were occasionally followed by questions that included potential solutions. This kind of feedback employed persuasive language in the form of a leading question, as exemplified below:

Maybe something like Terry fox day can be integrated into this? (Participant 9A)

What about sponsored posts that appear in users' feeds regardless of whether they follow the page or not? (Participant 2C)

How can we spread this message, through advertising? (Participant 8D)

Rarely, participants would identify issues through rhetorical question feedback. As the only question form not requiring answers from the peers, this feedback may have stimulated critical thinking and metacognition, as demonstrated below:

Idea 4 and idea 2 seems to be kind of similar. Why don't you combine the two, and increase people's knowledge about sports, fitness, etc. (Participant 1A)

I am just not sure how that would work because let's say we give that person that Nike gift card, how can we guarantee that that person will go to the gym. (Participant 1A)

How do we afford paying people to get healthy or justify shaming them into changing their lifestyle. (Participant 4A)

**Suggestion Feedback.** Participants tended to offer suggestions on peer ideas after first providing various forms of affective or cognitive feedback. In the three examples below, the participants first offered supportive feedback, following with explanation-reinforcing feedback, and closing with suggestion feedback:

I like how you have elaborated so much on every idea. It's Good to have a thorough description to fully understand what you have in mind. I also think that making the content relatable to the audience makes it the most appealing and yields the most effective outcome. For your 2nd idea, I suggest bringing out statistics of how the people who regularly look after themselves in terms of health are in a better shape and have a lower chance of contracting health issues in comparison with the people who have a sedentary and unproductive lifestyle. (Participant 4A)
I really liked the exercise idea and how you talked about dopamine levels and how lack of can lead to heart disease. One suggestion I do have is instead of saying "no smoking or drinking" you talk about why it can be a harmful thing to ones health as well as alternatives (Participant 7A)

This idea is very good. Very much in line with the reality in Ontario. In addition to this, you can add a section on how to be more productive and combine work and leisure on your posters. (Participant 7B)

In another example, the participant started with problem identification feedback directly leading into a specific suggestion on how to improve their teammate’s idea:

I believe employing a person who is already in an athletic shape might not appeal to the audience as their physique and lifestyle may be an alienated element to some people. Replacing the athlete with someone who has struggled with the health issues resulting from an unhealthy life in the past but has somehow managed to find motivation and transform themselves into a more healthy lifestyle appears more relatable and appealing to the audience. (Participant 4A)

There were also occurrences where participants provided overall suggestions on how to improve ideas within their teams. This is shown in the following example, where a Participant 10D addressed a lack of originality between their own and their teammate’s ideas, suggesting ways to make ideas more novel:

Your thinking is more similar to mine, and we all start from the direction of protecting people's health, to create happiness and wellness for them, maybe we can learn from our other teammates, from a psychological point of view, more in-depth thinking. (Participant 10D)

As with other feedback types, there were times when participants focused more on how ideas were communicated rather than the ideas themselves. In the following examples, participants provided praise first, then suggested methods for improvement:

I enjoy how you were able to come up with so many ideas in such a short amount of time; most of them are quite unique and detailed! I don't have any suggestions for improving the content of your ideas, but you could try categorizing or relisting them from most useful to least useful during the next phase to better elaborate your ideas (Participant 6A)
I like how the ideas focus more on the logistics of the PSA. Combined with some of the ideas and points I've seen, I think this would make figuring out what to do for a PSA easier. To strengthen the ideas, I'd suggest expanding them to include concrete outlines of how the PSA is presented, and what is included in the PSA, but I also like that they're just small ideas. Smaller ideas can easily be combined/ incorporated into other ideas, making them both original ideas that much better! (Participant 5B)

**Elaborating on Cognitive Feedback.** When expanding on their initial feedback, participants tended to focus on the subject matter of the ideas of their peers, rarely using personal experience-related feedback. This may have been due to the nature of the open-ended question provided during the activity, which was related to a psychologically anchored social need (i.e., personal health promotion). This subject may have been topically familiar but not necessarily relatable to the participants. In the examples below, the participants elaborated on why they felt their teammates’ ideas were not well developed, focusing specifically on the topics in question:

There are a lot of people on social media that advertise about fitness and a healthy lifestyle, and there are posters everywhere people go about having a fit body and eating well, but these are often brushed over because of there are double the amount of advertisements for greasy and unhealthy food. (Participant 1C)

If we were to do a regular health PSA of people eating fruits and jogging in a park, it wouldn’t strike the audience as unique and it wouldn’t have as much of an effective outcome. (Participant 4A)

**The Effects of Anonymity on Peer Feedback.** In conducting content pattern analysis of the qualitative dataset, I also discovered deviations from past online peer assessment research. Findings from Yu and Wu (2011) suggest that when giving feedback, to maintain their social networks, students tend to avoid overly negative and/or irrational comments to identifiable peers. While rare, when peers are anonymized, this type of feedback can become more frequent. However, I found no such incidents in the qualitative dataset (where all participants remained anonymous), possibly because the
activity did not take place during a live course where existing interpersonal relationships are often formed. Thus, these findings challenge the assertion that exposing the identity of peers may support more objective peer feedback.

**Analysis of the Creative Ideation Process within Teams**

**Descriptive Statistical Analysis of Creative Thinking Dimensions.** To answer the third research question, I first investigated how ideas changed within teams during the activity from both a quantitative and qualitative perspective. I used descriptive statistics for the quantitative portion of my analysis, where I took measurements of how ideas changed based on the fluency and elaboration constructs of the verbal TTCT.

**Fluency.** As the fluency construct refers to the number of ideas generated, I compared the total quantity of ideas shared during Part 1 and Part 3 of the activity. While Team 1 had no change and Team 8 and Team 9 had slight increases, most teams experienced a contraction of ideas after the peer assessment process that took place during Part 2 of the activity. As shown in Table 7 below, the total number of ideas shared within all teams dropped by 12 percent. It is possible this trend was the result of the peer assessment process stimulating idea refinement, which would likely have led to some ideas being withdrawn or combined.

Table 7

**Quantity of Ideas Shared Within Teams During Activity**

<table>
<thead>
<tr>
<th>Team</th>
<th>Number of Shared Ideas Before peer assessment</th>
<th>Number of Shared Ideas After peer assessment</th>
<th>+/- % change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>16</td>
<td>16</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>19</td>
<td>18</td>
<td>-0.05</td>
</tr>
<tr>
<td>3</td>
<td>16</td>
<td>14</td>
<td>-0.13</td>
</tr>
<tr>
<td>4</td>
<td>26</td>
<td>19</td>
<td>-0.27</td>
</tr>
<tr>
<td>5</td>
<td>12</td>
<td>9</td>
<td>-0.25</td>
</tr>
</tbody>
</table>
Elaboration. For each team, wordcounts were tallied for all data captured during Part 1 and Part 3 of the activity. Aside from Team 4 and Team 10, mean wordcounts expanded for all teams, with the average between all teams increasing by 43 percent. Since in general teams did not add more ideas after peer assessment, a rational explanation for this trend may have been that participants added to the ideas they chose to retain. Results are shown in Table 8 below.

Table 8

Mean Word Count of Shared Ideas Within Teams During Activity

<table>
<thead>
<tr>
<th>Team</th>
<th>Mean Word Count of Shared Ideas During Activity</th>
<th>+/- % change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Part 1 of Activity</td>
<td>Part 3 of Activity</td>
</tr>
<tr>
<td>1</td>
<td>576</td>
<td>811</td>
</tr>
<tr>
<td>2</td>
<td>624</td>
<td>928</td>
</tr>
<tr>
<td>3</td>
<td>529</td>
<td>941</td>
</tr>
<tr>
<td>4</td>
<td>1036</td>
<td>949</td>
</tr>
<tr>
<td>5</td>
<td>907</td>
<td>1548</td>
</tr>
<tr>
<td>6</td>
<td>549</td>
<td>713</td>
</tr>
<tr>
<td>7</td>
<td>634</td>
<td>1108</td>
</tr>
<tr>
<td>8</td>
<td>180</td>
<td>259</td>
</tr>
<tr>
<td>9</td>
<td>732</td>
<td>1236</td>
</tr>
<tr>
<td>10</td>
<td>335</td>
<td>251</td>
</tr>
<tr>
<td>Overall</td>
<td>610</td>
<td>874</td>
</tr>
</tbody>
</table>

Interestingly, these results did not appear to have much of a direct influence on participant perceptions of how well online peer assessment supported fluency or elaboration of ideas within teams. All groups scored high on perceptions of online peer
assessment’s support for fluency and elaboration regardless of actual variations in idea and word counts (see Table 4). As a highly immersive activity, it may have been the case that most participants gained a general sense that online peer assessment supported their team’s ability to think creatively by reflecting on their positive experiences during the activity rather than focusing on any specific objective outcome of the activity.

**Collective Case Study Pattern Analysis.** For the qualitative portion of analysis used to address the third research question, to illuminate some of the processes that may have led to participant perceptions, I identified and described patterns within the qualitative dataset. This included not only recounting how participants changed their original idea submissions during Part 3 of the activity, but also highlighting the potential sources of these changes. I selected four teams for this analysis. Each team was selected because of their unique characteristics partly related to the quantitative analysis for I conducted to answer the first and second research questions. The rationale for selecting each team for this collective case study and detailed analysis of each team’s creative ideation process is provided below.

**Pattern Analysis of the Creative Ideation Process for Team 5.** I selected Team 5 for this analysis to explore potential connections between the team’s shared positive perceptions of online peer assessment’s ability to support the team and the team’s varied use of feedback forms. This was evidenced by the team’s high mean survey score ($M = 4.8$), strong degree of interrater agreement ($r_{WG} = .88$), and relatively frequent use of feedback forms within both the affective and cognitive categories (See Table 6). I also had an interest in exploring what may have led to this team to ending up with the lowest
number of ideas but the highest mean word count of any of the 10 teams after participants gave and received feedback (See Table 7).

After analyzing Team 5’s complete text-based interactive dataset interactive captured in peerScholar during Part 2 of the activity, I discovered specific forms of feedback that appeared to have an influence on shaping ideas shared within the team. Problem identification, explanation- subject matter and suggestion feedback appeared to be the most influential cognitive feedback forms, while supportive and explanation-reinforcing appeared to be the most influential affective feedback forms.

For example, supportive and accompanying explanation-reinforcing feedback seemed to inspire members of this team to keep their ideas unchanged throughout the activity, while problem identification, explanation-subject matter and suggestion feedback tended to stimulate participants to elaborate on their originally submitted ideas. To illustrate, analysis of the interactive qualitative dataset collected through Team 5’s private channel in peerScholar is described below.

The first member (Participant 5A) submitted two ideas initially, the second of which involved the creation of a video. In their original submission they included the use of experts and statistics but did not specify the length of the video:

*Original Submission*

Make a PSA video about Personal Health and Wellness and include scenes such as:  
- The first scene can show a university student scrambling to finish their work while showing signs of distress, pulling out their hair, and banging their hand on their head  
- The second scene can then show the student getting up and walking to the bath and looking in the mirror at themselves deeply in their eyes and asking themselves, "What's wrong with me?"  
- The third scene can then show a scientist asking the viewers, "Are you struggling with your personal health and wellness?" and then proceed to state the statistics mentioned in Idea 1 and provide evidence of how personal health and wellness is correlated to an overall positive and better life.
The fourth scene can then show the scientist talking about different ways to promote positive personal health and wellness into one's life by explaining the various methods while showing video clips of people exercising, eating healthy, doing yoga, getting social support from family and friends, etc.

The fifth scene can then show the student in scene 1 implementing all these methods into their daily life slowly.

The sixth scene can then show the student in the same setting as scene 1 a month later but with the additions of a basketball or soccer ball in the background to represent how they've been incorporating physical activity into their life, a candle and a journal to represent how they've been incorporating personal time for themselves to journal down their thoughts, and calmly doing their work while looking presentable and much more happier.

The seventh scene can then show some resources where one can get help, seek treatment or speak to someone if they are having trouble. (Participant 5A)

Participant 5A received affective feedback in the form of supportive and accompanying explanation-reinforcing feedback from participants 5C and 5D, as seen below:

I like that the first idea will make use of statistics and I had a similar idea regarding the PSA video (Participant 5C)

Showing statistics is an effective method as it shows people that they are not alone in the illness they suffer, should they be suffering from one, and could also serve as an incentive to make people act in healthier ways to avoid becoming a statistic. (Participant 5D)

I like Idea 2 as the things you talk about resonate with the students. Hence, its more effective in that it speaks to its target audience. (Participant 5D)

Participant 5A also received forms of cognitive feedback from their peers. For example, Participant 5B advised Participant 5A to reduce the video length, while Participant 5C recommended Participant 5A expand the range of subjects beyond only university students:

Something to consider for the video would maybe be how to make it shorter (15-30 seconds)- videos of this length tend to catch young peoples' attention better and would make a greater impact on younger individuals. (Participant 5B)

The 2nd idea is good as many students do struggle with physical and mental issues but I would not want to limit to just university students. (Participant 5C)
The cognitive feedback offered to Participant 5A by Participant 5B and 5C seen above appeared to have a direct effect on the creative ideation of this team member. In Participant 5A’s modified submission shown below, the inclusion of a limited video length and expansion of subjects beyond only university students were additions directly associated with Participant 5B and 5C’s suggestions. While these changes were made, Participant 5A also left elements from their original submission intact, such as the use of statistics and keeping university students as subjects. It is highly likely Participant 5A kept these elements intact because of the affective feedback from Participant 5C and 5D, who reinforced the inclusion of these specific components. As Participant 5A did not reduce their ideas in their modified submission, peer assessment did not lead to this member contributing to the team’s overall reduction in fluency. However, Participant 5A’s modified submission showed an expanded wordcount, which contributed to the team’s overall increase in elaboration. Participant 5A’s full modified submission is seen below:

*Modified Submission*

Make a PSA video about 30-45 seconds long, about Personal Health and Wellness and include scenes such as:
- The first scene can show various short clips (4-5 clips of different people and different situations, to target a more broader audience as suggested in my feedback) of people going through a rough situation and stressing. For example, one of the clips can be a university student scrambling to finish their work while showing signs of distress, pulling out their hair, and banging their head on their head. Another example can be a mom in her kitchen with her kids running around her screaming, making a mess while her house is in a mess with toys and food everywhere while she struggles to control them and pick them up while she is clearly showing signs of distress and banging her head with her hand.
- The second scene can then show all the people used in the clips dropping everything that their doing (some might be looking in a mirror, some might be staring directly at the camera) and asking themselves, "What's wrong with me?"
- The third scene can then show a scientist asking the viewers, "Are you struggling with your personal health and wellness?" and then proceed to state the statistics
mentioned in Idea 1 and provide evidence of how personal health and wellness is correlated to an overall positive and better life.

- The fourth scene can then show the scientist talking about different ways to promote positive personal health and wellness into one's life by explaining the various methods while showing video clips of people exercising, eating healthy, doing yoga, getting social support from family and friends, etc.

- The fifth scene can then show all the people used in scene 1 with their different scenarios/situations implementing all these methods into their daily life slowly.

- The sixth scene can then show all the people in the same setting as they were in scene 1 a month later but with the additions of a symbol promoting personal health and wellness such as a basketball and/or exercise equipment to represent how they've been incorporating physical activity into their life, a candle and a journal to represent how they've been incorporating personal time for themselves to journal down their thoughts, or them gaining social support from their family and friends (For example, the mom in the kitchen could have the help of her husband/babysitter/friend to control the kids making the load/tasks lighter, and all the people calmly going through their situations while looking presentable, relaxed, collected, and much more happier.

- The seventh scene can then show some resources where one can get help, seek treatment, get additional information about personal health and wellness, or speak to someone if they are having trouble. (Participant 5A)

Participant 5B's original submission, which consisted of only a single idea, showed lower amount of elaboration and fluency than Participant 5A. Participant 5B's idea was described as using social media to promote personal health and wellness. The objectives of the PSA strategy were also described, as were the specific promotional tactics:

**Original Submission**

Social media "trend". Encouraging people to post about their daily routines and how they maintain personal health and wellness-- government could take submissions and repost them. Could inspire others to try out some of other people's routines. Could include fitness routines, self-care routines, cooking recipes, etc. (Participant 5B)

On this original submission, Participant 5B received several forms of cognitive feedback within the team. For example, they received suggestion feedback from Participant 5C, who recommended that Participant 5B integrate hashtags into the idea:
The social trend idea could be done through Instagram (through a specific hashtag #______Challenge or through TikTok, we can use a specific sound) (Participant 5C)

Another form of cognitive feedback came from Participant 5D, who used problem identification feedback to address their concerns with using social media to influence the public. Participant 5D then elaborated on these issues through explanation-subject matter feedback, as seen below:

First, these trends tend to end up revolving around those who are already healthy and such. Not to say that it's not good to help them as everybody COULD get healthier, however, this trend is taken up by those who tend to have an ulterior motive other than truly promoting mental health. This behavior is easily noticeable as the trend goes on. As a result of this realization, it's very possible that many people, especially those who are really in need of a better health would ignore such a trend. In short what I'm saying is that this concept of a trend, in personal opinion would not cry out to those who actually need better health. It could in fact do the opposite and cause those to ignore this simply because "it's a trend" and "trends are done by healthy attention seeking individuals (Participant 5D)

Participant 5D went on to further elaborate, leaving their comments open-ended without providing any specific suggestions on how to improve the participant’s idea:

The key, I believe is to have a PSA that is incentivizing to individuals. If its in a form of a trend, people could be incentivized to do this only in front of a camera or do it for a very short while up until the trend dies out. Therefore, perhaps proposing a longer-term solution, would be better. Though that being said, I cannot personally recommend you a better one. (Participant 5D)

Participant 5B’s modified submission showed some major changes to their original submission. As with Participant 5A, Participant 5B did not contribute to the team’s overall drop in fluency but did increase elaboration via higher final wordcount, again most likely resulting from team member feedback. Specific changes to Participant 5B’s original submission included integrating Participant 5C’s hashtag suggestion into
the idea, and addressing Participant 5D’s concerns by taking a more thoughtful and cautious approach to social media:

*Modified Submission*

how to prevent the "trend" from going south? Is this possible?-- Maybe rather than a trend (because I agree that they can be harmful), it just be a social media event where people can submit helpful tips that are reposted by the government. The hope for this idea is to encourage and inspire people to try different ways of staying healthy. There could be themed weeks where social media posts are made with these tips and with some info graphics, and the end of each week a live cast events hosting professional nutritionists or personal trainers, etc that people can attend to learn more about how they can maintain personal health and wellness. This could maybe start out as a huge thing, where everyday for a month there's a post dedicated towards informing consumers, and eventually dwindle down to a post a week, and a live event once a month. There could still be a hashtag maybe, and that's how people submit their personal tips? Or the tips should probably be consulted by a professional first to make sure they aren't harmful, so maybe it would just be an anonymys forum? (Participant 5B)

Even after peer assessment, Participant 5B’s modified submission appeared to still be under some development, as evidenced by their use of question mark comments within their idea description. One reason this may have been the fact that Participant 5B did not receive many peer comments that included explicit suggestions on ways to improve the idea. As a result, Participant 5B may have ended up giving no definitive solutions in their final idea submission, but instead provided several options and leaving the idea somewhat open-ended.

While similar forms of feedback were given to the third member of Team 5, unlike the others, Participant 5C did contribute directly towards the team’s reduced fluency. They originally submitted five ideas that were much more general, described only as bullet points in a few words:

*Original Submission*

Idea 1: Using enticing visuals, if we're making an infograhic.
Idea 2: Focusing on a specific issue
Idea 3: Could be an informative video, with statistics and real 'testimonies'
Idea 4: addressing misconceptions and stereotypes - Folks tend to attribute specific appearances to different types of wellness matters... Depression or exhaustion do not have a specific face
Idea 5: Advising to check up on their loved ones, as they are sometimes the ones we tend to neglect the most (Participant 5C)

Participant 5C received supportive feedback on some of basic elements of their ideas from Participant 5A and Participant 5D:

Personally I agree with this person on how using enticing visuals is a key aspect if making an infographic as enticing visuals grab the viewer's attention and make them want to read into the concept/idea more! I do not see anything wrong in making an infographic nor do I see anything wrong with this idea. (Participant 5A)

Enticing visuals is something I totally agree with. To capture the audience is an incredibly important step for people to listen into a PSA. Addressing misconceptions is also very good as for those who would listen, would be able to change their minds. This could in fact be very effective as if a common misconception were addressed, it is possible that it could be shared around due to its unexpected nature, reducing the information failure of people. Advising to check up their loved ones is a tough one to talk about because its possible that some people don't love anybody. However, I believe this is good. Its nice to incentivize people to do things for the better of other people. Perhaps by reaching out to their family would help their health as well as theirs. I completely agree with focusing on a specific issue as well. Although its good to focus on a broad spectrum of issues, by focusing on a specific one, its possible to narrow down the target audience and help them specifically. The merits of this is arguably higher than making a general PSA covering a large spectrum of topic, as the things mentioned in those are very broad to save time. (Participant 5D)

Several peers also gave problem identification feedback, unsurprisingly indicating a lack of detail as a common concern as well as issues with the central focus of some of the ideas themselves. They also provided suggestion feedback related to these apprehensions:

I disliked how there wasn't much detail added to this idea, I also feel like an infographic by itself might be boring for the viewer as there will just be statistics and visuals without any context about the main topic of personal health and wellness itself. A suggestion I have for this student is to maybe do an infographic with a poster itself surround the stigmas of personal health and wellness and ways
to promote it so that it is more enticing and worth reading for the viewer. (Participant 5A)

I wish there was more detail as to how we can focus on a specific issue, what specific issue, what steps visually and artistically can we take as a group to promote this idea, etc... My suggestion on how to enhance this idea is to simply add more context, thought, and detail into it by answering/thinking about the questions I stated and implementing them into their idea. (Participant 5A)

A critique I would give is focusing on a specific issue. Perhaps mention a specific issue for instance a common one such as depression or anxiety rather than an uncommon one like the Diogenes syndrome. (Participant 5D)

Interestingly, prior to receiving the feedback above, as evidenced by the feedback Participant 5C gave to Participant 5A during Part 2 of the activity, Participant 5C also seemed to recognize the issue of lack of detail in their original idea submission:

I like how detailed each idea is.. makes me realize I should've added alot more detail to mine haha (Participant 5B)

Other suggestion feedback directed towards Participant 5C came from Participant 5B, who recommended that Participant 5C combine some of their ideas and to elaborate more fully:

I like how the ideas focus more on the logistics of the PSA. Combined with some of the ideas and points I've seen, I think this would make figuring out what to do for a PSA easier. To strengthen the ideas, I'd suggest expanding them to include concrete outlines of how the PSA is presented, and what is included in the PSA. (Participant 5B)

After participating in the peer assessment process during Part 2 of the activity, Participant 5C made several revisions to their originally submitted list of ideas. In total, Participant 5C’s fluency decreased from five ideas to two. Participant 5C appeared to respond to Participant 5B’s suggestion to combine their ideas, as Participant 5C integrated some of ideas while adding specificity and elaborating on the details. This led
to an overall expansion of word count in Participant 5C’ modified submission, shown below:

*Modified Submission*

Idea 1: Using enticing visuals, if we're making an infographic + Idea 2: Focusing on a specific issue
- Infographics are quick way to grab attention and to spread an important message. The infographic could be used to give tips on how to cope with anxiety.
- Recommending breathing exercises, mindfulness etc.

Idea 3: Could be an informative video, with statistics and real 'testimonies' + Idea 2: Focusing on a specific issue
- Focusing on depression or bipolar disorders found in the elderly. For some reason, our elders never seem to be the focus on these types of conversations while they are some of the main ones dealing with loneliness.

Video concept:
1. The beginning of the video could just be the listeners hearing a variety of voicemails from these elderly actors examples: 'Hey (insert random name) this is grandpa just wondering how you are doing' 'Hi (insert random name) this is grandma, just checking up on you nd your siblings' etc...
2. It can then fast forward to clips of these older folks, staring solemnly at their phones or out their window.
3. Including relevant statistics
4. It can end with their family members or loved ones calling them back or visiting them with hugs and flowers and all of those cute things. OR it can end sadly, with them being alone or crying, showing the realities of loneliness.

(Participant 5C)

**Summary of Findings for Team 5.** It can be said that peer assessment had an overall increasing effect on elaboration but ultimately decreasing effect on fluency within this team. One reason for this may have been the range of detail and specificity of team members’ initial ideas. The bigger, more elaborate, and specific their ideas, the less tendency they had to reduce or combine their ideas after peer assessment, whereas the smaller or vaguer their ideas, the more likely they were to build them into fewer, more developed ideas.

The specific forms of peer feedback participants in this team used was also shown to have had a likely influence the team’s drop in fluency and increase in elaboration. The
most common form of affective feedback was supportive feedback, which likely
encouraged participants in Team 5 to retain elements of their ideas. Direct and specific
forms of cognitive feedback that were more prescriptive in nature tended to inspire
specific actions on behalf of participants, such as combining ideas or making
recommended changes or inclusions, which tended to reduce the number of shared ideas
in the process. When no direct solutions were provided however, participants would often
elaborate on their ideas but leave them somewhat unfinished and open for further
development within the team. The increase in elaboration within this team did not involve
generating any new ideas. Rather, it was the result of participant’s retaining some of their
original idea elements and then building on them, likely through the various insights
provided via peer assessment.

In summary, during the activity, Team 5 started with many original ideas that
were reduced to a much shorter list, where the final ideas integrated many suggestions
and resolved identified issues that were shared within the team during the peer
assessment process. While no completely new ideas were generated within the team after
peer assessment, the significant amount of idea refinement may have led participants in
this Team 5 to share a common perceptive that online peer assessment was highly
effective in supporting the team’s creative thinking processes.

Pattern Analysis of the Creative Ideation Process for Team 8. Team 8 was
chosen to be part of this analysis due the team’s unique feature of having the lowest mean
survey score ($M = 3.7$) but highest interrater agreement ($r_{WG} = .96$) of all 10 teams. In
essence, members of this team shared the perceptive that online peer assessment only
moderately supported the team. Furthermore, Team 8 had the lowest use of feedback for
both the affective and cognitive categories (See Table 6). Yet while the team had the highest number of ideas of any of the 10 teams after team members gave and received feedback (See Table 7), Team 8 had a relatively low mean word count compared to most other teams (See Table 8). Considering all these factors, it may have been the case the team’s combination of limited peer feedback, high fluency but low elaboration led to participants sharing the perspective that online peer assessment was not as effective at supporting the team’s creative thinking. It was this presupposition that drove my desire to explore and describe how ideas were communicated, assessed, and refined throughout the activity.

When compared to Team 5, Team 8 diverged in several ways. Fluency did increase slightly as elaboration, but in general the ideas shared within this team were much vaguer and nondescript compared to Team 5, often consisting of short, single sentences. Most of the ideas shared within Team 8 focused on either communication mediums (e.g., a poster, radio, etc.) or a general concept or message, but often not both. Participant 8A started the activity by submitting six ideas that were described in brief sentences, mentioning various forms of media that could be used in the development of a PSA:

Original Submission
Idea 1: Posting banner around the urban area / On the business entrance
Idea 2: Using radio to broadcast the information when needed.
Idea 3: Posting short videos to popular platforms on Ads or specific Short video
Idea 4: Using broadcast in a crowded area by sounds record
Idea 5: Posting the Health poster to every community by postal service
Idea 6: Integrating the fund of public health care system (Participant 8A)

Participant 8A received affective feedback in the form of supportive feedback from participants 8D and 8B. This feedback reinforced all six ideas shared by Participant 8A:

idea 1-5: interesting way to use many types of media to establish a goal. i like how it targets a variety of members of the public
idea 6: this is a great way to get funding for projects like these. (Participant 8D)

I like your idea 3, I think using popular social media platform to put the PSA on is a very good idea (Participant 8B)

Participant 8A also received cognitive feedback. Participant 8B offered problem identification feedback for idea 6, describing a lack of clarity with the idea. Participant 8B then followed up this feedback with clarifying question feedback:

I'am a little bit unsure of what idea 6 means, are we adding fundings, reorganize current fundings, or encourage public donations? (Participant 8B)

Another form of cognitive feedback directly towards Participant 8A was suggestion feedback used by Participant 8C, who recommend Participant 8A include the specific messaging that would be used in the ideas.

These are very great ways to ensure that the information gets to who they need to get to. But I think you could enhance your ideas by thinking of the information that is meant to be sent to the consumers, which I believe is the main aim of the experiment. (Participant 8C)

Interestingly, Participant 8A did not act on any of this feedback. After receiving feedback from their peers, Participant 8A did not make any revisions to their original submission. It is therefore likely the assessment process did not stimulate greater development of ideas for this participant. One possible reason for this may have been because peer feedback in this team was less varied and elaborate.

Content analysis of Participant 8B’s interactive data provides similar insights to findings for Participant 8A. Participant 8B began the activity by submitting seven ideas that were also very brief, some consisting of only a few words describing advertising themes or topics:

Original Submission
idea 1: get enough sleep
idea 2: drink water regularly
idea 3: have good hygiene  
idea 4: exercise  
idea 5: don't sit for too long  
idea 6: get a pet  
idea 7: explore different hobbies (Participant 8B)

While Participant 8B did not make changes to any of these ideas, they did add one new idea that explained the proposed medium (infographic) and media (social media) used to communicate all ideas. This contributed to the team’s increase in elaboration and was the reason for the team’s slight increase in fluency:

*Modified Submission*

idea 1: get enough sleep  
idea 2: drink water regularly  
idea 3: have good hygiene  
idea 4: exercise  
idea 5: don't sit for too long  
idea 6: get a pet  
idea 7: explore different hobbies  
idea 8: create an infographic and use social media to distribute it (Participant 8B)

The trend of receiving limited detail and variety of peer feedback continued for Participant 8B. Most feedback Participant 8B received consisted of only one or two sentences. For example, Participant 8A used problem identification feedback to address the participant’s lack of focus addressing the open-ended problem given in the activity:

I think over the idea was a bit over simple and the practice was dismissed regards to the question. (Participant 8A)

Participant 8C used supportive feedback followed by problem identification feedback to address issues with the narrow scope of the participant’s sixth idea:

These are a very good number of ideas that we all should know to keep us going and healthy! Not everyone can get a pet though, sadly :(. (Participant 8C).
The addition of an eighth idea by Participant 8B may have been inspired by feedback received by the final peer (Participant 8D), who used suggestion feedback to recommend that Participant 8B combine their ideas into a singular fully developed idea:

all of these ideas would go really well together on some sort of advertisement or lesson for the public. so maybe using these themes on different types of advertising. (Participant 8D).

While Participant 8B did not combine all their ideas into one, they did explain how all ideas would be communicated through their addition of an eighth idea. This idea helped explain the proposed medium (infographic) and media (social media) used to communicate all ideas, as shown in Participant 8B’s final modified submission below:

*Modified Submission*
idea 1: get enough sleep
idea 2: drink water regularly
idea 3: have good hygiene
idea 4: exercise
idea 5: don't sit for too long
idea 6: get a pet
idea 7: explore different hobbies
idea 8: create an infographic and use social media to distribute it (Participant 8B)

As with Participant 9A, peer assessment did not have much impact on Participant 8B’s during the activity. Again, this was likely due to an overall lack of depth and variety in peer feedback within the team. As a result, Participant 8B did not make changes to any of their original ideas. The addition of an eighth idea fromParticipant 8B was the reason for the team’s slight increase in fluency and contributed to the team’s increase in elaboration.

With only two ideas initially shared with Team 8, Participant 8C had the lowest fluency of all team members. Participant 8C’s ideas consisted only of short, vague statements, with no mention of any specifics related to the PSA. Details that would likely
be important for their peers to fully understand the ideas, such as advertising mediums, intended messages, promotional strategies, or goals, where not included in the original ideas shared by Participant 8C:

*Original Submission*

idea 1: People learning not to group a certain disorder by only a certain characteristics
idea 2: A lot of people still have no idea that they are not alone. (Participant 8C)

All feedback received by this participant started with affective feedback that was brief and general. As seen below, all three other team members began their comments using supportive feedback:

The idea is overall great (Participant 8A)
I agree with all your ideas. (Participant 8B)
idea 1: i like this idea (Participant 8D)

Feedback directed towards Participant 8C’s ideas quickly shifted from affective feedback to cognitive feedback. “Participant 8A used problem identification feedback to indicate that while Participant 8C’s first idea did address a way to improve personal health and wellness, it lacked a description of how the idea could be promoted to the public:

The idea is overall great. But it not a solution to promote but a suggestion to getting the better mental state (Participant 8A)

Participant 8D provided suggestion feedback for Participant 8C to improve their first idea through elaboration, followed by provoking question feedback related to thinking of how the idea might be executed:

idea 1: i like this idea, but maybe elaborate, how would we teach people to do this? (Participant 8D)

The cognitive feedback from participants 8A and 8D likely stimulated Participant 8C’s creative thinking towards the development of the idea. After peer assessment, Participant
8C elaborated on their first idea by including media that would be used to communicate the idea to the intended audience, as shown in the excerpt from Participant C’s modified submission:

*Modified Submission*
idea 1: People learning not to group a certain disorder by only certain characteristics by putting out more information out there, through social media platforms and physical posters about different disorders in order to enlighten people more about them (Participant 8C)

Further cognitive feedback was seen from participants 8D and 8B. Participant 8D gave leading question feedback, guiding Participant 8C to consider radio as a potential medium to communicate the messaging behind their second idea. Participant 8B asked a similar question, only using provoking question feedback that did not include any suggestions:

idea 2: again how can we spread this message, through advertising? (Participant 8D)

I agree with all your ideas. As you mentioned in idea 2, a lot of people thinks they are alone, what are some ways we can let them know they are not alone? (Participant 8B)

The cognitive feedback received by participants 8D and 8B also seemed to have a direct impact on Participant 8C’s creative ideation. As seen in Participant 8C’s modified submission below, radio advertising, a method included in Participant 8C’s leading question, was integrated into idea 2. Furthermore, Participant 8C addressed Participant 8B’s provoking question by describing how radio could reinforce the positive messaging behind idea 2:

*Modified Submission*
idea 2: A lot of people still have no idea that they are not alone, so by voicing it out on the radio and other broadcasting networks to remind people everywhere that they are not alone in this struggle, whatever it is. (Participant 8C)
After the peer assessment process, Participant 8C chose to retain both ideas but further develop them. The decision to keep both ideas instead of withdrawing them and creating new ones was likely borne out receiving supportive peer feedback, as all peers gave positive praise for the ideas, and none suggested removing them. The changes Participant 8C made to their originally submitted ideas were directly associated with cognitive peer feedback they received. Peer feedback received by Participant 8C was more dynamic and persuasive than that directed towards participants 8A or 8B, which may have helped to stimulate creative thought. While Participant 8C did not end up contributing to the team’s fluency, they did increase Team 8’s elaboration. Participant 8C’s complete modified submission is included below.

**Modified Submission**

idea 1: People learning not to group a certain disorder by only certain characteristics by putting out more information out there, through social media platforms and physical posters about different disorders in order to enlighten people more about them
idea 2: A lot of people still have no idea that they are not alone, so by voicing it out on the radio and other broadcasting networks to remind people everywhere that they are not alone in this struggle, whatever it is. (Participant 8C)

Participant 8D started the activity by sharing seven ideas that described mediums of communication but not necessarily the subject matter of such communication:

**Original Submission**

idea 1: posters in schools or community centers
idea 2: assembly at school to discuss personal health and wellness
idea 3: adding healthier food options to cafeteria food
idea 4: promoting daily exercise
idea 5: Use social media like TikTok to send a message
idea 6: Use celebrities to enforce the message
idea 7: reduce stigma about mental health (Participant 8D)

Participant 8D received mostly affective feedback from their peers in the form of supportive and elaboration – reinforcing feedback:
I think all of your ideas are well thought-out. (Participant 8B)

Nice work! I definitely think they should increase healthier food options in cafeteria food. And also, I like your idea of more assemblies at school to discuss personal wellness. This is important as a lot of people do not have an outlet, and they do (Participant 8C).

As with other members of Team 8, this positive praise was the likely reason why Participant 8D chose to retain all their ideas in their modified submission.

Only Participant 8A provided cognitive feedback to Participant 8D. This took the form of problem identification,

The overall idea was great I like most of the ideas regards to promoting health. However, the idea I think is not specific enough to promote a specific subject. (Participant 8A)

This feedback likely inspired Participant 8D to elaborate on the specific messaging behind ideas 1, 5, and 7 in their modified submission:

 Modified Submission
 idea 1: posters in schools or community centers about making healthy decisions
 idea 2: assembly at school to discuss personal health and wellness
 idea 3: adding healthier food options to cafeteria food
 idea 4: promoting daily exercise
 idea 5: Use social media like TikTok to send a message about maintaining a healthy lifestyle
 idea 6: Use celebrities to enforce the message from posters or tiktok
 idea 7: reduce stigma about mental health by clearing up misconceptions

As shown above, all ideas remained intact and in some of the ideas, subject matter was added. This slightly increased the team’s elaboration, though it did contribute to a change in Team 8’s fluency. While it is true that Participant 8D received very limited cognitive feedback from peers, it is likely that giving feedback to others may have also played a role in their increased elaboration. From analysis of the interactions between Participant 8D and Participant 8B, we can see from that Participant 8D felt that Participant 8B’s ideas consisted of basic themes but lacked methods of communication:
**Original Submission**

idea 1: get enough sleep
idea 2: drink water regularly
idea 3: have good hygiene
idea 4: exercise
idea 5: don't sit for too long
idea 6: get a pet
idea 7: explore different hobbies (Participant 8B)

all of these ideas would go really well together on some sort of advertisement or lesson for the public. so maybe using these themes on different types of advertising. (Participant 8D).

While Participant 8D’s original ideas did include methods of communication, they often lacked themes. It is therefore possible that by assessing peers, through critical reflection, Participant 8D became more informed about the limitations of their own ideas, which may have been further reinforced by the cognitive feedback they received from Participant 8A. It is therefore possible that both giving and receiving peer feedback stimulated critical thought towards Participant 8D’s own creative thinking processes.

**Summary of Findings for Team 8.** In summary, Team 8’s creative ideation can be described as less advanced than Team 5’s. Initial ideas shared within this team were limited as they often focused only on subject matter or methods of communication, but rarely both. Furthermore, while idea revisions tended address some of the limited focus of initially shared ideas, such revisions lacked the richness and depth of modified ideas shared within Team 5.

While receiving feedback was shown to have a key influence on idea modifications within the group, peer feedback itself was not as sophisticated as Team 5. First, the total feedback coding count in Team 8 was the lowest of all 10 teams. Second, giving peer feedback was likely to have stimulated greater idea development in only one member of the team and did not appear to play a significant role in idea development.
overall. Only one member of this team ended up generating a new idea after the peer assessment process, which was most likely inspired by suggestion feedback they received.

In conclusion, it is likely that by a combination of limited ideas and peer feedback, this team lacked the necessary triggers to stimulate critical reflection and exploration of ways to enhance shared ideas beyond basic adjustments. This may have been the primary reason why Team 8 had the lowest mean survey perceptual score of the 10 teams ($M=3.7$), but the highest agreement ($r_{WG} = 0.96$). In other words, there was a very strongly held belief that online peer assessment only moderately supported the team’s creative thinking processes during the activity.

**Pattern Analysis of the Creative Ideation Process for Team 4.** As with Team 5, Team 4 members also shared overall positive perceptions of online peer assessment’s ability to support the team’s creative thinking. While Team 4’s mean survey score was lower than Team 5’s ($M=3.9$), interrater agreement was very strong ($r_{WG} >= .91$) within this team. In other words, there was high collective agreement that online peer assessment was effective in supporting the group’s creative thinking, but effectiveness was not perceived to be as high as most other teams. Also, like Team 5, feedback participants gave to their peers was relatively balanced between both cognitive and affective feedback categories (See Table 6). But while fluency also dropped after participants in this team gave and received feedback (See Table 7), unlike Team 5, elaboration did not increase (See Table 8). Thus, while Team 4 appeared to have similar characteristics as other teams, I selected this team to be included in my analysis because of the team’s unique drop in both fluency and elaboration during the activity, which I
sought to study in greater detail through exploration of the team’s creative ideation process.

Participant 4A shared seven ideas within the team. While some ideas described different advertising media and messages, others described only advertising objectives or specific content and did not define media:

*Original Submission*

Idea 1:
Using statistics of the number of people suffering from health issues to show the importance of addressing this matter.

Idea 2:
Using anecdotes and stories of people who have suffered from health issues to appeal to the audience.

Idea 3:
Using vibrant colours and concise language to convey the message.

Idea 4:
Posting the advertisement on public spaces such as metro stations and universities to reach the maximum level of people.

Idea 5:
Employing social media tactics to further educate people on the significance of the cause.

Idea 6:
Imploring popular figures promoting the message makes the ad more enticing.

Idea 7:
Including a QR code on the ad redirecting people to a website where more information is made available. (Participant 4A)

Participant 4D used supportive feedback to express praise for Participant 4A’s ideas, then used problem identification feedback to address concerns with the lack of details on how Participant 4A’s ideas would be executed:

I can see that a lot of your focus was on how you'd be able to grab and hold the audience's attention, which I appreciate. It's very important to not only have a good amount of subject matter but to also plan out the delivery and details. (Participant 4D)

Participant 4D then proceeded to give supportive and explanation-reinforcing feedback specific to each idea:
Ideas 1, 2: I like the different appeals that you're using here.
Idea 4: This one stood out to me. The PSA is only as good as its reach, so it
definitely is important that we get as many people to see it as possible.
Ideas 5, 6: These are especially important, just like your first and second ideas.
Audiences tend to respond to subliminal messages, especially ones from authority
figures.
Overall, I liked your vision for how the PSA would be designed and integrated.
It's great! (Participant 4D)

While Participant 4D did identify problems with some ideas, the issues described were
briefly nested within feedback that in general offered only praise. It is possible that
because the critical feedback was not made more obvious, it may have been missed by
Participant 4A. Furthermore, the language used was not direct and rather persuasive in
nature. This approach to addressing issues with Participant 4A’s ideas may have been
friendlier in nature but ultimately did not influence any development in Participant 4A’s
ideas.

Participant 4B opened their comments to Participant 4A using problem
identification feedback related to the first idea:

For idea 1, personally I feel like putting statistics will not attract audience. They
would view it as information or a fact and not be motivated to actually change
their way of living.

Participant 4B then followed with supportive and explanation-reinforcing feedback,
providing praise for the Participant 4A’s second idea:

Idea 2 is good. By using an inspirational story of someone who lacked motivation
at one point and then put themselves together will surely inspire others and give
them hope that they can also lead a healthy life if they put their mind to it.

Participant 4B closed their comments by offering suggestion feedback for Participant 4A
to combine their second idea with ideas 3 through 7:

The rest of the ideas I feel like are just ways to enhance the psa so they can be
incorporated into idea 2. (Participant 4B)
Had Participant 4A acted on the above feedback provided by Participant 4B, they would likely have withdrawn their first idea and integrated the remaining ones into the second idea. None of this occurred and the feedback from Participant 4B ultimately did not trigger any changes in Participant 4A’s ideas.

As with other members of the team, Participant 4C paired supportive feedback with explanation-reinforcing feedback:

I really liked idea 1 because seeing the extreme ends of the scale of personal health and wellness could serve to significantly encourage an individual to change their negative habits.
I like idea 6 a lot as well because many individuals do look up to influencers as models in different areas of their life. (Participant 4C)

Like the feedback approach by Participants 4B and 4D, Participant 4C also followed affective feedback with cognitive feedback, offering suggestion feedback, recommending Participant 4A combine their first and second ideas into one:

I feel like idea 1 and 2 would work great together because having both a statistical approach in addition to a testimonial is a great way to incorporate both a qualitative and quantitative aspect of presenting such information. (Participant 4C)

Participant 4C also offered suggestion feedback on ways to further develop Participant 4A’s sixth idea:

Perhaps to enhance this, some influencers could not only serve as sources of advertising personal health but also find ways to engage with citizens- whether it's creating workout videos or such. This will help encourage individuals on a personal level, for them to understand that they could work their way to their goals as well. (Participant 4C)

An examination of Participant 4A’s modified submission indicates none of Participant 4C’s feedback had any apparent influence on changing Participant 4A’s ideas.

The above analysis indicates that receiving peer feedback may have influenced Participant 4A’s retention of ideas, likely due to receiving a high degree of affective
form of peer feedback. However, peer feedback did not seem to influence the participant to make any changes to their ideas despite receiving feedback from Participant 4C to do so. Participant 4A’s complete modified submission is included below:

\textit{Modified Submission}

Idea 1:
Using statistics of the number of people suffering from health issues to show the importance of addressing this matter.

Idea 2:
Using anecdotes and stories of people who have suffered from health issues to appeal to the audience.

Idea 3:
Using vibrant colours and concise language to convey the message.

Idea 4:
Posting the advertisement on public spaces such as metro stations and universities to reach the maximum level of people.

Idea 5:
Employing social media tactics to further educate people on the significance of the cause.

Idea 6:
Imploring popular figures promoting the message makes the ad more enticing.

Idea 7:
Including a QR code on the ad redirecting people to a website where more information is made available.

Idea 8:
Putting together a comprehensive reward system for people who made apparent changes to their lifestyles as a response to the PSA.

As seen above, after peer assessment, Participant 4A retained all ideas and made no revisions, but did add an eighth idea. This contributed to the team’s fluency but had no effect on elaboration. Interestingly, Participant 4A’s new idea (idea 8) did not have an obvious connection to any peer feedback they received from other members of the team. This begs the question of what may have inspired Participant 4A to include the new idea in their modified submission. The answer may be found in analysis of Participant 4C’s third idea, which was shared with Participant 4A during Part 2 of the activity:

Many individuals are drawn to the idea of a competition, the idea of a reward or being considered a ‘winner’ often encourages individuals to participate in such an
activity. Thus, using this as a basis, the Ontario government could encourage its
citizens to pursue personal health by participating in such a challenge. Such
challenges could incorporate going out for a daily walk, participating in a
wellness group with members from your neighbourhood weekly, or even just
going plugged into a book club or chess club within your community. Such
opportunities not only provide individuals with a sense of community but also
embrace collective growth which is an essential aspect of personal wellness.
(Participant 4C)

Analysis of Participant 4A’s supportive and explanation-reinforcing feedback offered to
Participant 4C during Part 2 of the activity confirms Participant 4A’s endorsement of the
above idea:

   Establishing a system of reward is also a positive idea as it entices more people to
engage with the announcement. (Participant 4A)

It can therefore be said that Participant 4A’s increase in fluency was derived not from
receiving peer feedback, but by being exposed to the ideas of others.

   The next team member, Participant 4B, submitted only two ideas, the smallest
number within the team. However, their ideas were more specific and included mention
of both the medium, advertising tactics and some mention of content:

   Original Submission
   Idea 1: Video
   Use an athlete and their perspective on how to stay active and fit both mentally
and physically. The video should be constructed in such a way that the audience
who views it are also equally motivated to improve their standards of living.

   Idea 2: Poster
   Posters are easily shareable, especially on social media. By creating an eye-
catching piece many people especially will come across and definitely interact
with the post. (Participant 4B)

   Participant 4B received some affective forms of feedback from peers, again
through supportive and explanation-reinforcing feedback:

   While you only have 2 ideas, I think they are really well thought out and excellent
foundations for a PSA.
Your first idea stuck out to me, as there was more detail, and I really liked the subject matter. (Participant 4D)

However, cognitive feedback was the most common category of peer feedback directed towards Participant 4B. For example, both participants 4A and 4C used problem identification and some explanation-subject matter feedback to indicate potential issues with an advertising tactic described in Participant 4B’s first idea:

I believe employing a person who is already in an athletic shape might not appeal to the audience as their physique and lifestyle may be an alienated element to some people. (Participant 4A)

Idea one is a great start! However, some possible dilemmas are viewers are often comparing themselves to individuals who are presented as accomplished in the department of physical wellbeing. As a result, this may be considered unmotivating for many as the experiences or lifestyle of the athlete might not be relatable for many. For example, consider postpartum women who are trying to find the motivation to get back up and seek after their personal fitness. An athlete might not always be the best image to go for. (Participant 4C)

Participant 4A followed up their comments with suggestion feedback that likely resulted in Participant 4B’s increase in both fluency and elaboration through the expansion of idea 2 and addition of idea 3:

Replacing the athlete with someone who has struggled with the health issues resulting from an unhealthy life in the past but has somehow managed to find motivation and transform themselves into a more healthy lifestyle appears more relatable and appealing to the audience. Your second idea sounds pretty interesting but we need more description as to how you suggest we make the poster more enticing to the audience. (Participant 4A)

Further potential influences on Participant 4B’s increase in elaboration was found in Participant 4C’s provoking question feedback. It is likely this specific feedback stimulated Participant 4B’s creative thought, resulting in the addition of advertising content originally missing in their second idea:

I agree that posters are an effective technique! Some questions for further consideration would be- what would such posters entail? What would be the
primary message? What steps in designing the poster are going to be taken to make it informative yet appealing for the audience? (Participant 4C)

After the peer assessment process, Participant 4B retained idea 1 but refined idea 2 by expanding on their poster concept. As mentioned, changes to idea 2 were most likely due to Participant 4B responding to Participant 4A’s suggestion to make idea 2 more enticing. As a result, Participant 4B added specific content to the idea, which included using statistics and quotes within the messaging of the poster. Participant 4B also added a third idea (idea 3) that was similar to the video concept from idea 1. Instead of focusing on athletes however, the video would show someone struggling with living an unhealthy lifestyle. This line of thought showed an obvious connection to Participant 4A’s suggestion that idea 1 be reoriented to focus more on personal health challenges rather than athleticism. In this case, the suggestion feedback Participant 4B received did not inspire changes to their existing idea, but instead led to the development of a new idea.

*Modified Submission*

**Idea 1:**
Use an athlete and their perspective on how to stay active and fit both mentally and physically. The video should be constructed in such a way that the audience who views it are also equally motivated to improve their standards of living.

**Idea 2:**
Posters are easily shareable, especially on social media. By creating an eye-catching piece many people especially will come across and definitely interact with the post. This poster would need to include both statistics and messages from real people explaining the benefits they faced from switching their lifestyle and making more healthy choices.

**Idea 3:**
Create a video of someone who at one point in their life lacked motivation but changed and is now leading a better happier and healthier life. This will allow audience members to feel optimistic and challenge themselves to bring out the best version of themselves. (Participant 4B)
The third team member, Participant 4C, provided very descriptive ideas, not only including specific tactics and media to be used in the PSA, but also describing the advertising content, background details, as well as justifying why they suggested the ideas they did:

**Original Submission**

Idea 1: People are often greatly appealed to when they're able to relate to what is being specific aspects of what is being promoted. Therefore characteristics that appeal to the general population should be the primary focus. For example, a video can be recorded with the hook lines stating "Are you always tired? Feeling unmotivated?" or something along those lines, that draws the audience's attention because it is something they can often relate to.

Idea 2: Draw a comparison between individuals who look after their personal health consistently and those who do periodically to highlight the side effects of not consistently prioritizing personal wellness.

Idea 3: Many individuals are drawn to the idea of a competition, the idea of a reward or being considered a 'winner' often encourages individuals to participate in such an activity. Thus, using this as a basis, the Ontario government could encourage its citizens to pursue personal health by participating in such a challenge. Such challenges could incorporate going out for a daily walk, participating in a wellness group with members from your neighbourhood weekly, or even just getting plugged into a book club or chess club within your community. Such opportunities not only provide individuals with a sense of community but also embrace collective growth which is an essential aspect of personal wellness.

Idea 4: For a target audience of younger children or youth, the Ontario government could establish that credits be offered for participating in clubs or sports teams. Many students enjoy participating in sports and clubs however, abstain from doing so because they 'don't have the time because of school.' However, if one is receiving credits for it then, they would be able to partake in something they enjoy and put their full effort towards it. Participating in clubs and teams gives a sense of community environment which has been heightened especially during the global pandemic. Fostering such social communities, where one can not only be physically active but also social can play a critical component in bettering one's mental and physical wellbeing. (Participant 4C)

All members of Team 4 directed supportive, explanation-reinforcing and suggestion feedback to Participant 4C. Most often peers offered praise for Participant 4C’s elaboration:

I like how you have elaborated so much on every idea. (Participant 4A)
I think idea 1 is a great for a psa. Especially because it gives authority to the viewer to decide whether or not they would like to create positive change in their lives. (Participant 4B)

Overall, you have managed to fully cover the ideas you have included and I don’t think any corrections will be needed. Great Job!! (Participant 4A)
Firstly, I wanted to tell you that I really liked how thorough and well thought out your ideas are. (Participant 4D)

Idea 1: I find the point you made about the audience relating better to media they see themselves in to be accurate. (Participant 4D)

Idea 3: I like how you incorporated the idea of a community working together to better themselves, as this is usually the reality. Change doesn't happen purely individually, and I'm digging the idea. (Participant 4D)

Idea 4: Children are definitely the foundation of the future. I'm running out of time, but all in all, your ideas are fantastic! I can see us building on them in part 2, for sure. (Participant 4D)

Some peer suggestions directed towards Participant 4C included ways to resolve issues, combining elements of ideas and adding specific content:

For your 2nd idea, I suggest bringing out statistics of how the people who regularly look after themselves in terms of health are in a better shape and have a lower chance of contracting health issues in comparison with the people who have a sedentary and unproductive lifestyle. (Participant 4A)

Maybe instead we should address companies to incorporate some health and wellness system within their workplace. Likewise, making it mandatory to take health and physical education throughout school years and university years should be added. (Participant 4B)

When you combine this point with your following ideas, I think it creates a very effective and appealing PSA. (Participant 4D)

Only Participant 4B provided problem identification feedback, which addressed challenges with their third and fourth ideas:

Idea 3 and 4 would need a lot of planning and convincing. Having easily accessible resources to exercise and maintain a healthy and active life is good, however depending on the schedules of each individual, it may differ. (Participant 4B)
In the end, Participant 4C made no changes to their original submission, thus having no effect on the team’s elaboration or fluency. Ultimately, the combination of suggestion and problem identification feedback did not stimulate changes with Participant 4C’s ideas, perhaps because Participant 4C’s ideas were already well developed and more advanced than other members of the team. It is therefore possible that after being exposed to peer ideas, the participant was not inspired to make changes.

It was the output of Participant 4D’s creative ideation that led to the team’s overall reduction in fluency and slight decline in elaboration. This participant initially submitted 13 ideas, some of which were not entirely separate but continuations of other ideas. The approach Participant 4D took communicating their ideas to their teammates was varied. While some ideas included descriptions of advertising content the messaging themes, others were only written down thoughts and reflections, even including hypothetical questions and answers:

*Original Submission*

Idea 1: A classic health and wellness PSA that shows people doing healthy things (exercising, social gatherings, fruits and vegetables, playing with pets, etc.) and being happy. It's uplifting and encouraging

Idea 2: In a different vain we can have show what the effects of not doing the above things can have on a person. An individual that stays inside, isolates, doesn't eat well, and doesn't have fun as a representation of that.

Idea 3: Who says these all need to be example-driven? There could be an A&W style advertisement where we survey Ontarians out on the street and ask them whether or not they do certain things. It'll give the viewer at home a sense of where they stand among the populace.

Idea 4: How about we just pay people to be healthy. I'm sure nearly everyone would eat well and exercise if we made it cheap and rewarded it. The best and most expensive PSA of all.
Idea 5: Shame everyone until we take care of ourselves and our well-being out of pure guilt. (These ideas are getting more ridiculous as time passes.)

Idea 6: Instead of shaming, we can threaten in the video/poster/etc. Do it, or else. I think we could use the looming threat of early death over viewers' heads. "Exercise, or you'll die early, bedridden and with a bad back." Or "Eat well, or else your teeth will rot and you'll die of scurvy."

Idea 7: Back to the shame tactic, we can interview people in less fortunate circumstances, even in other countries... (I didn't complete this thought because I realize it's getting off-topic a little.)

Idea 8: PSA could focus on removing the stigma of seeking psychological help. Seeing therapists and psychiatrists is still heavily looked down upon in older people and those coming from other cultures. There's no point in trying to better yourself if you're too tired/sad to even bother/

Idea 9: The more I think about it, the more I realize how ineffective the classic ad of 'look at how happy these healthy people are' is.

Idea 10: We weaponize nostalgia and film a commercial with glowing and happy children. They play outside, they're hugged when they cry, they reluctantly eat vegetables, and they're strong and growing. Then we cut to them as adults. This is where the idea in my head gets fuzzy.

Idea 10.1: What if it doesn't cut to adulthood? It starts and ends with happy, healthy children. Maybe the sense of longing will nudge the viewer into wanting to recapture that feeling.

Idea 11: When making a PSA, I realize there's no way you can tell the viewer to "get up and go do it." It's supposed to plant a seed, and it's up to the viewer to decide whether or not they want to water it. This isn't so much an idea as it is an observation. It helps with the process.

Idea 12: Get a celebrity to lecture the audience. There's a reason they're hired for ads for cleaning supplies and clothes brands. Why not throw health and wellness into the mix?

Original ideas
Revised ideas
Feedback from peers (Participant 4D)

Peer feedback that Participant 4D received was more detailed and varied than other members of Team 4, with a balance of affective and cognitive feedback forms. All participants offered supportive and accompanying explanation-reinforcing feedback
except for Participant 4A, who offered only cognitive feedback using problem identification, explanation-subject matter, suggestion, clarifying question and rhetorical question feedback. While avoiding any personal attacks or harshness, Participant 4A’s comments were very direct and often critical. For example, they identified problems with Participant 4D’s first idea, following up with explanation-subject matter to justify their concerns:

I think the first idea is pretty basic and needs a few extra elements to appear more enticing to the audience. If we were to do a regular health PSA of people eating fruits and jogging in a park, it wouldn’t strike the audience as unique and it wouldn’t have as much of an effective outcome. (Participant 4A)

In contrast with Participant 4A’s cognitive feedback above, Participant 4C offered praise for Participant 4D’s first and second ideas using a combination of supportive and explanation-reinforcing feedback:

I like how Idea 1 and 2 work well together because you show both sides of the coin, and as a result you can display to the general population the benefits of practicing personal wellness and the risks in avoiding doing so. (Participant 4C)

This combination of both cognitive and affective feedback from participants 4A and 4C may have stimulated further creative ideation in Participant 4D. Ultimately both ideas were retained but merged into one and further elaborated to address the concerns.

Participant 4A went on to identify issues with how idea 3 was described, leading into clarifying question and suggestion feedback:

Also, I’m slightly confused as to how idea 3 will be included on the announcement. Do you suggest we draw a diagram out of the survey conducted and include it on the final product or do you want to handpick a few cases and highlight them? You need to include further elaboration. (Participant 4A)

Some concerns regarding Participant 4D’s third idea were also addressed by Participant 4C, who used a variety of cognitive feedback strategies to communicate their concerns:
For idea 3, my only concern would be that many individuals currently don't consistently practice personal wellness, so how would that serve to encourage the viewer? Additionally, the Hawthorne effect could also influence the validity of the survey conducted. Many might say they're physically active, because they know they're being studied and the results will be broadcasted. Thus, the audience might be comparing themselves to inaccurate standards. (Participant 4C)

However, not all members of the team showed concerns for the idea. Participant 4B fully agreed with idea 3, offering praise in the form of supportive and explanation-reinforcing feedback:

I really liked idea 3, because in a way it is quizzing people in real life. They’ll feel self-conscious and start making more healthy choices. (Participant 4B)

As mentioned, Participant 4D did not end up abandoning the idea altogether. Instead, they kept the basic concept while addressing apprehensions communicated by peers by changing how the idea would be executed. Interestingly, no team member ever recommended shifting the focus of idea from live interviewing to a rewards campaign. It is likely Participant 4D settled on this change in isolation, by ideation stimulated directly from the peer feedback they received.

Participant 4A also identified problems with the nature of Participant 4D’s fourth and fifth ideas, using rhetorical question feedback as a means of elaborating on their concerns:

Ideas 4 and 5 are quite bizarre and frankly impractical. How to we afford paying people to get healthy or justify shaming them into changing their lifestyle. (Participant 4A)

As seen in Participant 4D’s modified submission, both ideas were withdrawn and not integrated into the four final ideas that were shared within Team 4.

Further problem identification feedback was given by Participant 4A regarding the questionable nature of Participant 4D’s seventh idea, which originally involved
Purposefully interviewing individuals in less developed countries to highlight the importance of personal health.

Idea 7 is also unethical as we can’t choose a gung ho strategy and grasp at ANY idea to appeal to the masses. (Participant 4A)

Participant 4D ultimately withdrew idea 7 in their modified submission. It is likely the feedback from Participant 4A induced critical thinking and reflection within Participant 4D that led to this omission.

Participant 4A closed their comments by directing general suggestion feedback to Participant 4D, recommending the participant focus on eliminating impractical ideas.

This feedback did appear to influence Participant 4D’s drop in fluency:

I suggest you reduce the number of ideas and focus on improving a few by prioritizing practicality and the moral norms and ethical boundaries we have in Ontario. (Participant 4A)

Finally, Participant 4D received encouraging supportive and explanation-reinforcing feedback from Participant 4C regarding idea 8. This feedback was followed by provoking question and explanation-subject matter feedback that likely led to the idea being retained and elaborated on by Participant 4D:

I really like idea 8, I think it's so timely especially in light of the current pandemic. The question now becomes- how can one encourage others to seek assistance. Although there are many resources available, the problem exists in the liminal space between the resources and the individual who requires such assistance. (Participant 4C)

Participant 4D’s modifications to their initial ideas were far more substantial than their peers, and as mentioned above, driven largely by peer feedback. Total ideas went from 12 down to four, with many of their previous thoughts integrated into the key ideas they retained. Idea 1 was combined with idea 2 and elaborated to describe not only positive messaging to encourage self-care, but also fear-based themes, including showing
the risks of neglecting personal health. This became idea 1 in the revised submission.

This change also integrated elements from other ideas Participant 4D initially shared.

This included concerns about using solely positive emotional reinforcement mentioned in idea 9 and the underlying concept of fear-based advertising found in ideas 5, 7 and 11.

Participant 4D also revised idea 3, which became idea 2 in their modified submission, as shown below. While the basis of the idea stayed remained (i.e., advertising through live interaction with citizens), the idea was adjusted from conducting live street interviews to a campaign showing individuals engaging in personal-health activities who would be randomly rewarded for their efforts. Idea 3 in Participant 4D’s modified submission was an expansion of idea 6 in their original submission, where they added a disclaimer that explained the psychological reasoning behind the idea. Finally, Participant 4D refined their original idea 6, which ended up becoming idea 4 in their modified submission.

While the participant retained the central purpose and messaging focus behind this idea, they added a description of what content would be included in the advertisement. Ideas 4 and 5 found in Participant 4D’s original submission were ultimately withdrawn. These revisions are shown below:

**Modified Submission**

Idea 1: A classic health and wellness PSA that shows people doing 'healthy' things (exercising, social gatherings, fruits and vegetables, playing with pets, etc.) and being happy. We can then juxtapose it to what the effects of not doing the above things can have on a person. An individual that stays inside, isolates, doesn't eat well, and doesn't have fun as a representation of that. It could be really cheesy and end with the 'unhealthy' individual deciding to leave their home and join the people outside. And they all lived happily ever after.

Idea 2: I like the possibility of turning this issue into something like a game show. Rather than interviewing people out on the street and asking them whether or not they do healthy things, we can catch passersby jogging, or whatever, and reward them with something little like a gift card. We could end the video by saying we'll still be out prowling the streets and surprising the people with random gifts.
Idea 3: Instead of shaming, we can threaten in the video/poster/etc. Do it, or else. I think we could use the looming threat of early death over viewers' heads. "Exercise, or you'll die early, bedridden and with a bad back." Or "Eat well, or else your teeth will rot and you'll die of scurvy." I say this not as a vicious fearmongering tactic, but as an appeal to our innate fear of death, or at least the fear of missing out on the things that matter to us.

Idea 4: PSA could focus on removing the stigma of seeking psychological help. Seeing therapists and psychiatrists is still heavily looked down upon in older people and those coming from other cultures. There's no point in trying to better yourself if you're too tired/sad to even bother. We could ask people who come from these demographics to reflect on how therapy has changed their lives, and maybe ask those close to them how it affected them as well. (Participant 4D)

**Summary of Findings for Team 4.** It can be said that peer assessment had a significant impact on Team 4’s creative ideation activity. Some members of this team showed noteworthy refinement of their ideas, driven by the cognitive forms of peer feedback they received. Interestingly, cognitive feedback forms did not stimulate further creative ideation in Participant 4C, likely because this participant’s initial ideas started off more detailed and developed than their peers. In this case, the participant may have not found the process of being exposed to shared peer ideas, giving, and receiving feedback to be as useful as other members of the team.

In Team 4, two team members generated completely new ideas after peer assessment. Participant 4B’s new idea likely surfaced from being exposed to shared ideas within the team. Participant 4A’s new idea did not appear to be linked with peer feedback they had received. Instead, the idea likely surfaced because Participant 4A’s creative thought processes were triggered by exposure to others’ ideas and giving supportive and explanation-reinforcing feedback on those ideas through the peer assessment process itself.
While the team’s decline in fluency was associated with a single team member, much of the team’s slight drop in elaboration came from an overall trend of combining and refining existing ideas. Furthermore, unlike Team 5, which had an increase in elaboration despite a decrease in fluency, the degree of refinement of ideas was not as equally advanced between team members. Had all team members developed their ideas at a more consistent level, it is likely Team 4 would also have shown an increase in elaboration.

More consistent than quality of ideas shared within the team was the overall high degree of depth and variety in peer feedback provided by each team member. The fact that the team’s mean survey score was lower than other teams came as little surprise, since despite the quality of feedback found in this team, peer assessment did not have the same impact on all team members’ refinement of ideas. Overall perceptions of how well online peer assessment supported the team’s collaborative creative thinking were high \((M=3.9)\), but not as strong as other teams that may have had greater refinement of ideas after the peer assessment process. Based on these assumptions, the very strong degree of perceptual agreement within Team 4 \((r_{WG} = .94)\) was likely due to team members having dissimilar individual experiences but sharing similar perspectives about how well online peer assessment supported the team as a whole.

**Pattern Analysis of the Creative Ideation Process for Team 9.** Team 9 stood out not only because cognitive forms of feedback were used more frequently than any other team, but also because the team had a high mean survey score \((M = 4.8)\) but only a moderate level of interrater agreement \((r_{WG} = .67)\), the lowest of all 10 teams. This meant that while most members of Team 9 thought online peer assessment supported the team
well, not everyone in the team shared that opinion. I was therefore interested in exploring any potential connections between feedback and subsequent collective perceptions within this team.

Content analysis of Team 9’s qualitative interactive data showed similar patterns to those discovered in other teams. Receiving peer feedback throughout the peer assessment process tended to also be the central source of elaboration in this team. Team 9 had the highest coding count of cognitive feedback, using the greatest variety of feedback forms including common use of question-based feedback. In terms of affective feedback, all team members gave supportive feedback, with more team members giving personal experience feedback than any of the other nine teams.

The team’s slight increase in fluency was partially explained by the large number of ideas that ended up being retained throughout the activity, likely the result of most members of Team 9 receiving various forms of affective feedback from peers. This feedback likely provided reinforcement for members of Team 9 to retain their ideas in their modified submissions during Part 3 of the activity. However, unique to this team was an idea generated by Participant 9D after the peer assessment process. This idea did not appear to be linked with peer feedback in any way. Instead, the idea likely surfaced because Participant 9D’s creative thought processes were triggered by exposure to others’ ideas and giving feedback on those ideas through the peer assessment process itself.

Ideas shared within this team were described briefly, therefore providing opportunities for participants to elaborate on them, which often they did. There was some variation in terms of the way ideas were described. For example, while Participant 9B
had very limited idea descriptions, Participant 9C tended to jot their ideas down in lists, while Participant 9D described their ideas more as a written proposal with greater detail.

Participant 9A initially shared 4 ideas within the team:

*Original Submission*

1. **idea 1: posters + interactive websites**
   1. posters can be placed in busy places with QR codes on them, that then lead people to an interactive website where they get to explore different topics, symptoms, cures etc.
2. **idea 2: social media campaigns**
   1. in todays time, social media is the easiest way to raise awareness. Doing poll stories and making short, simple, sharable posts is a very easy to get word out
3. **idea 3: documentaries**
   1. although it sounds a little bit boring, its probably the closest people can get to witnessing the effects of poor vs good healthcare. Interviews can be done of people with access to "5-star" healthcare vs people who barely have access to simple medications to show the need for improvement
4. **idea 4: games**
   1. I believe that we as humans remember things best when they've happened to us personally (first hand experience). Miniature games can be created where a series of choices are given, which present the audience with results regarding how personal choices can affect physical and mental wellness.

Participant 9A received supportive feedback followed by problem identification feedback from Participant 9C and provoking question feedback from Participant 9D below:

**Idea 1: loved the idea!! Although, just a thought, it may be hard to keep peoples attention enough to scan a QR code, especially if they are running to their next class or activity.** (Participant 9C)

**Idea 1: SO COOL I LOVE IT! What types of interactive activities will people find on the sites? How will they attention be captured?** (Participant 9D)

In their modified submission, Participant 9A added a description for how the attention of the audience would be captured in idea 1, thereby addressing the problem identification feedback from Participant 9C and provoking question feedback from Participant 9D:

*Modified Submission*

1. **idea 1: posters + interactive websites**
1. posters can be placed in busy places with QR codes on them, that then lead people to an interactive website where they get to explore different topics, symptoms, cures etc.

1. to catch attention, maybe we can set up a booth that also lets them enrolled for gift cards? (Participant 9A)

For their second idea, Participant 9A received positive praise followed by clarifying question feedback from Participant 9C and provoking question feedback from Participant 9D:

Idea 2: loveeee because it is modern thinking! obviously this’ll spread the word quick because everyones using it so its a great idea! What would you have in mind it terms of what it will be promoting? (Participant 9C)

Idea 2: What will be special about the account that will make people follow it? How will their attention be caught and what will set this account apart from other mental health ones? (Participant 9D)

As with Participant 9A’s first idea, a similar trend occurred in the development of Participant 9A’s second idea. As shown below in Participant 9A’s modified submission, their second idea was retained but the primary messaging behind the idea was added, likely as a direct response to the clarifying question feedback Participant 9A received from Participant 9C:

**Modified Submission**

idea 2 : social media campaigns

1. in todays time, social media is the easiest way to raise awareness. Doing poll stories and making short, simple, sharable posts is a very easy to get word out

1. these activities can be on clearing up stigma or myths about illnesses or symptoms

The process of influencing idea retainment through affective feedback types carried over for Participant 9A’s third idea. Participant 9C gave supportive feedback followed by explanation-reinforcing feedback on idea 2:

Idea 3: totally agree! I think its is a good idea! It will also truly show the difference in status in a way (“poor” or “rich”) (Participant 9C)
Participant 9C continued their comments through a combination of suggestion and clarifying question feedback:

you can even add making a movie night or something for people to come to, so they can watch the documentary. Would you make the documentary or use one thats already published? (Participant 9C)

While Participant 9A did not act on Participant 9C’s suggestion, they did end up elaborating on their third idea as a means of following up on the question provided by Participant 9C:

Modified Submission
idea 3 : documentaries
1. although it sounds a little bit boring, its probably the closest people can get to witnessing the effects of poor vs good healthcare. Interviews can be done of people with access to "5-star" healthcare vs people who barely have access to simple medications to show the need for improvement
1. if in budget, we can make a documentary so that its "up to date". But if not, there's no harm in using one already published (Participant 9A)

Interestingly, Participant 9A did not change their final fourth idea. This lack of alteration may have been reinforced by the encouragement Participant 9A received from Participant 9C, as shown below:

Idea 4: YESSS loved this idea! Love the creativity and im so sure itll captivate a great audience!

Furthermore, unlike their other ideas, Participant 9A only received clarifying question feedback from one peer (Participant 9D):

Idea 4: what type of games? would this be like in the form of ex. a kahoot? (Participant 9D)

It is possible that receiving a question from only a single peer did not prompt elaboration in Participant 9A the same way it may have when they received questions from multiple peers. The limited cognitive feedback directed towards Participant 9A’s fourth idea may
have been the reason why Participant 9D’s feedback was not addressed by Participant 9A, who did not end up elaborating on this idea in their modified submission.

After peer assessment, Participant 9A chose to retain all their ideas and elaborate on them, which did not change the team’s fluency but did increase elaboration:

*Modified Submission*

**idea 1: posters + interactive websites**
1. Posters can be placed in busy places with QR codes on them, that then lead people to an interactive website where they get to explore different topics, symptoms, cures etc.
1. To catch attention, maybe we can set up a booth that also lets them enrolled for gift cards?

**idea 2: social media campaigns**
1. In today's time, social media is the easiest way to raise awareness. Doing poll stories and making short, simple, sharable posts is a very easy to get word out
1. These activities can be on clearing up stigma or myths about illnesses or symptoms

**idea 3: documentaries**
1. Although it sounds a little bit boring, it's probably the closest people can get to witnessing the effects of poor vs good healthcare. Interviews can be done of people with access to "5-star" healthcare vs people who barely have access to simple medications to show the need for improvement
1. If in budget, we can make a documentary so that its "up to date". But if not, there's no harm in using one already published

**idea 4: games**
1. I believe that we as humans remember things best when they've happened to us personally (first hand experience). Miniature games can be created where a series of choices are given, which present the audience with results regarding how personal choices can affect physical and mental wellness. (Participant 9A)

Analysis of peer feedback that Participant 9A received revealed likely sources behind this team member’s increase in elaboration. As consistent with trends seen in other teams, Participant 9A’s decision to retain all their original ideas was likely influenced by the overall acceptance their teammates had for their ideas through the affective feedback they received. Participant 9A’s resulting elaboration appeared to be driven by the various forms of cognitive peer feedback.
Participant 9B shared only three ideas with their team that were far more brief than other team members. The ideas were communicated in short sentences, and described basic personal health and wellness concepts with no mention of how the ideas would be executed, or the purpose behind the ideas:

*Original Submission*
idea 1: get free periodic comprehensive medical testing per year.
idea 2: sell well-being food more in the store.
idea 3: basic medical cost can be cheap. (Participant 9B)

Unsurprisingly, analysis of peer feedback indicated Participant 9B’s elaboration was also driven by the cognitive feedback they received. For example, Participant 9C provided general suggestion feedback for Participant 9B to elaborate, followed by problem identification feedback describing why it was necessary to do so:

These ideas are great! Elaborate! It's a bit hard to see where your head is at when you don’t write too much.

Participant 9C also included suggestion feedback that indicated ways for Participant 9B to elaborate:

Things you can in a way enhance or elaborate on, just how you think it is possible to reach people and promote your ideas as well as how will help in promoting well being! (Participant 9C)

For their first idea, Participant 9B received suggestion, clarifying question and explanation-subject matter feedback from participant 9A and 9D:

idea 1: yeah! maybe we can provide this yearly at schools and work places? (Participant 9A)

idea 1: it is great idea but ultimately how will we pay for this? will the government have to increase tax? because at the end of the day this will mean more work hours which means more employees, which means they need to get paid, and the government can't just pull money out of thin air. (Participant 9D)
An analysis of Participant 9B’s modified submission suggested that peer feedback did illicit action by Participant 9B to develop their first idea. They expanded the idea to include schools, employers, and government-funding, all of which came from suggestion, clarifying question and explanation-subject matter peer feedback provided by participants 9A and 9D:

*Modified Submission*
idea 1: get free periodic comprehensive medical testing per year. Some people cannot take comprehensive medical testing because it is expensive. Government should make holiday for take testing and make it free on the day. Companies can support employees to get free or cheap periodic test during the work. Also in the school, they will support students and employees to get testing. (Participant 9B)

For Participant 9B’s second idea, Participant 9A confirmed their support while offering clarifying question feedback:

idea 2: good approach, but any opinions as to what foods exactly? (Participant 9A)

Participant 9D brought up a concern with accessibility regarding Participant 9B’s second idea, using problem identification and provoking question feedback:

idea 2: this is also a cool idea but well-being foods are costly, therefore a lot of people can't afford them. So how can we make this accessible to everyone. (Participant 9D)

In their modified submission, Participant 9B added depth and detail to their second idea that included a direct response to Participant 9A’s clarifying question feedback.

*Modified Submission*
idea 2: sell well-being food more in the store. Promote the advantages of eating well-being food, ex. fruit, vegetables, organic. Showing some people's interview who ate well-being food and become healthy. (Participant 9B)

Interestingly, from the modified version of idea 2 above, we can see that Participant 9B did not address Participant 9D’s open-ended question. One explanation for this is because
Participant 9A’s question was more direct and could therefore be answered through convergent thinking to arrive at specific conclusions. This kind of thought modality may have been more comfortable and familiar to the participant. In contrast, Participant 9D’s question was more indirect and would have required Participant 9B to engage in divergent thinking to answer it, which may have demanded more time and effort.

Participant 9B only received one peer comment for their third idea, offered by Participant 9D through problem identification feedback:

Idea 3: I don't understand.

Despite being brief, this feedback may have been enough to stimulate creative thought in Participant 9B. In their modified submission, the participant ended up elaborating on the idea that was initially underdeveloped and unspecific:

*Modified Submission*
idea 3: basic medical cost can be cheap.
Some countries medical cost is expensive even they have kinds of medical insurance. So, poor people are excluded to services. Government can support poor people to use medical service in very cheap cost. (Participant 9B)

As with Participant 9A, Participant 9B’s creative ideation was almost certainly driven by peer feedback they received. While analysis of Participant 9B’s final modified submission indicates that they did not respond to all peer feedback, their revisions did contribute to the team’s increase and elaboration, but did not change fluency:

*Modified Submission*
idea 1: get free periodic comprehensive medical testing per year.
Some people cannot take comprehensive medical testing because it is expensive. Government should make holiday for take testing and make it free on the day. Companies can support employees to get free or cheap periodic test during the work. Also in the school, they will support students and employees to get testing. idea 2: sell well-being food more in the store. Promote the advantages of eating well-being food, ex. fruit, vegetables, organic. Showing some people's interview who ate well-being food and become healthy. idea 3: basic medical cost can be cheap.
Some countries medical cost is expensive even they have kinds of medical insurance. So, poor people are excluded to services. Government can support poor people to use medical service in very cheap cost. (Participant 9B)

The next member of Team 9, Participant 9C, had greater fluency and elaboration than Participant 8B, initially sharing four ideas that included some mention of how ideas would be executed, providing descriptions of personal health and wellness concepts but no mention of specific advertising messages. Below their idea descriptions Participant 9C also included a list of bullet points that did not clearly connect to any one of the four ideas but may have been random snippets of ideas the participant wanted to share with their teammates. A unique characteristic of Participant 9C’s approach to describing their ideas was their occasional use of metalanguage, where they included messages about their own ideas, as seen at the tail end of their fifth idea below. This approach was not something commonly used by other participants in the study:

*Original Submission*

IDEA 1: QUICK AFFIRMATIONS - poster with reassurance so that if they read enough times they'll think it and in a way manifest it
Therefore everytime someone reads it they hear themselves saying it!
"Im doing great!" ETC

IDEA 2: POSITIVITY!!!!
it's like free association in a way. You just put words out there and let the come up with their associations with it like if sees a poster with positivity and good things around will incorporate that into their mind and day! (Literally just a poster with big words on them around the school)

IDEA 3: Poster that you can write on and brainstorm
write your worst thought of yourself and then write 2 more good things about yourself. on a bristle board in the hall. JUST TO REMEMBER AND PRAISE OUR VICTORIES!!

IDEA 4: ask questions ontop to capture attention such as:
"Feeling burnt out?"
"Feeling Stressed?"
"Feeling unhappy"
REASSURANCE BELOW AND COPING MECHANISMS such as who to call
IDEA 5: Maybe a hug board. Have a giant sized bear and just hug it to feel the warmth?? might be too weird lets see others think.

brainstorm
- be straight forward (if there are topics that may be uncomfortable, just be straight forward about it!
- include things that are relevant (like if this is for campus, dont have a target audience of an older crowd)
- use something funny (comedic relief)
- use something that is different that catches the eye! (EX adidas used a confident, beautiful model with down syndrome to promote how strong every story is POSSIBLE!
- think of things that what are easy to remember (put something thats an eye catcher or something thatll ingrain in peoples minds!!
- coping mechanisms (how to deal with things you may be experiencing)
- put colors on the paper that'll attract or be somewhat related to your topic (if about depression probably wont want to put colorful images since might even come off as dont know what speaking about) (Participant 9C)

Participant 9C received affective feedback from Participant 9A, who used a blend of supportive and personal experience to reinforce Participant 9C’s first idea:

idea 1: simple and to the point! there's this message service on phones, mostly shows up a spam message, but it sends daily affirmations which I think are super cute and effective in promoting wellness (Participant 9A)

Participant 9D provided cognitive feedback for idea 1 in the form of provoking question and clarifying question feedback to address concerns regarding how the strategy behind the idea would be executed:

Idea 1: cool! how will the poster grab peoples attention? will it have some type of theme or specific colours to make it stand out? (Participant 9D)

As a trend seen in other teams, it appeared that the combination of affective and cognitive feedback also influenced Participant 9C to retain their idea and elaborate on it, as seen in the entry below from their modified submission:

*Modified Submission*
IDEA 1: QUICK AFFIRMATIONS - poster with reassurance so that if they read enough times they'll think it and in a way manifest it. Therefore every time someone reads it they hear themselves saying it! "I'm doing great!" ETC - to grab the attention, I'd use eye grabbing colors for the affirmations, and ones that stand out over a dark background. In a way can represent those words of kindness standing out in a pit of darkness. (Participant 9C)

The only form of cognitive feedback Participant 9A provided to Participant 9C was rhetorical question feedback related to idea 2:

idea 2: I like this too! but what if people don't necessarily associate the words with mental wellness? (Participant 9A)

For the same idea, Participant 9C also received cognitive feedback from Participant 9D, who used a combination of problem identification and leading question feedback to address their concerns:

idea 2: I wonder if this might be a bit confusing if people just see random words on posters... Maybe phrases with a small explanation or something? (Participant 9D)

This feedback is what likely led Participant 9C to elaborate on their second idea, as Participant 9C's response to Participant 9D is clearly found in the below excerpt from their modified submission:

**Modified Submission**
IDEA 2: POSITIVITY!!!! it's like free association in a way. You just put words out there and let the come up with their associations with it like if sees a poster with positivity and good things around will incorporate that into their mind and day! (Literally just a poster with big words on them around the school) there will be an explanation in the bottom of what the purpose is. But I somewhat like the sense of someone having to ask themselves, "what am I reading this for?" (Participant 9C)

Participant 9C also received praise on their third idea from Participant 9A, who again used supportive and personal experience feedback:

idea 3: I like this one the most. I feel like when we see other people's struggles it can remind us that we are not alone. Where we have been challenged with
supposedly impossible tasks, there are many others we've conquered as well (Participant 9A)

Unsurprisingly, Participant 9D primarily offered cognitive forms of feedback for Participant 9C’s third idea, using a combination of problem identification, explanation-subject matter feedback and leading question feedback, as shown below:

Idea 3: I love this it is cool... However, I don't think people will want to write about their worst qualities. I believe this puts them in a vulnerable state which is something people like to avoid. What if we make it anonymous? This might make people more open. (Participant 9D)

Once again, analysis of Participant 9C’s modified submission indicated that the combined effects of receiving a variety of feedback within both feedback categories is likely what led Participant 9C to retain and then elaborate on idea 3:

_Modified Submission_
IDEA 3: Poster that you can write on and brainstorm write your worst thought of yourself and then write 2 more good things about yourself. on a bristle board in the hall. JUST TO REMEMBER AND PRAISE OUR VICTORIES! Will happen anonymously (Participant 9C)

Positive comments continued for Participant 9C’s fourth idea through the personal experience feedback given to Participant 9C by Participant 9A and Participant 9D:

Idea 4: whenever I see posters like these I think there talking directly to me. so this is a good way to have the message "stand out" (Participant 9A)

Idea 4: This is great and it is always important in my opinion to read information like this. As uni students it is very normal for all the above listed feelings you have indicated to occur so it is important we learn how to deal with them (Participant 9D)

As expected, Participant 9C retained their fourth idea, making no changes or additions in their modified submission.

For Participant 9C’s fifth and final idea, they received supportive feedback from Participant 9A:
idea 5: adorable! hugs make everything better :) (Participant 9A)

As with other ideas shared by Participant 9C, Participant 9D tended to offer more
cognitive forms of feedback for this idea, offering a combination of problem
identification and leading question feedback:

   Idea 5: this is my favourite one. However with regards to covid I am not sure how
comfortable people will be with this one... Maybe if we gave out small bears for
people to hug instead? (Participant 9D)

Recall that Participant 9C expressed uncertainty with the quality of their fifth idea
in their original submission, as shown in the following excerpt:

   Original Submission
IDEA 5: Maybe a hug board. Have a giant sized bear and just hug it to feel the
warmth?? might be too weird lets see others think. (Participant 9C)

Ultimately, Participant 9C kept idea 5 in their modified submission, likely because of the
positive affective forms of peer feedback they received that likely reduced their original
doubts about the idea. Since they decided to keep the idea, their previous message at the
end of idea 5’s description was removed. Participant 9C then expanded the idea as a
means of following up on the problem identification and leading question feedback they
received from Participant 9D. This gave the idea a more fully developed structure:

   Modified Submission
IDEA 5: Maybe a hug board. Have a giant sized bear and just hug it to feel the
warmth?? if not liked because of covid, will give out smaller bears. (Participant 9C)

Participant 9C’s modified submission had no change in fluency but did show an
increase in elaboration. As mentioned, the participant did not adjust any of their original
ideas but did refine them through elaboration:

   Modified Submission
IDEA 1: QUICK AFFIRMATIONS - poster with reassurance so that if they read
enough times they’ll think it and in a way manifest it
Therefore everytime someone reads it they hear themselves saying it! "I'm doing great!" ETC - to grab the attention, id use eye grabbing colors for the affirmations, and ones that stand out over a dark back ground. In a way can represent those words of kindness standing out in a pit of darkness.

IDEA 2: POSITIVITY!!!!
its like free association in a way. You just put words out there and let the come up with their associations with it like if sees a poster with positivity and good things around will incorporate that into their mind and day! (Literally just a poster with big words on them around the school) there will be an esplination in the bottom of what the purpose is. But i somewhat like the sense of someone having to ask themselves, “what am I reading this for?”

IDEA 3: Poster that you can write on and brainstorm
write your worst thought of yourself and then write 2 more good things about yourself. on a bristle board in the hall. JUST TO REMEMBER AND PRAISE OUR VICTORIES! Will happen anonymously

IDEA 4: ask questions ontop to capture attention such as:
"Feeling burnt out?"
"Feeling Stressed?"
"Feeling unhappy"
REASSURANCE BELOW AND COPING MECHANISMS such as who to call
quick affirmations

IDEA 5: Maybe a hug board. Have a giant sized bear and just hug it to feel the warmth?? if not liked because of covid, wikl give out smaller bears.

brainstorm
- be straight forward (if there are topics that may be uncomfortable, just be straight forward about it!
- include things that are relevant (like if this is for campus, dont have a target audience of an older crowd)
- use something funny (comedic relief)
- use something that is different that catches the eye! (EX adidas used a confident, beautiful model with down syndrome to promote how strong every story is POSSIBLE!
- think of things that what are easy to remember (put something thats an eye catcher or something thatI ingrain in peoples minds!!
- coping mechanisms (how to deal with things you may be experiencing)
- put colors on the paper that'll attract or be somewhat related to your topic (if about depression probably wont want to put colorful images since might even come off as dont know what speaking about) (Participant 9C)
There was no evidence to suggest Participant 9C’s elaboration stemmed from being exposed to shared ideas within the team. As mentioned in earlier analysis, keeping their ideas intact and then elaborating on them was likely inspired by receiving highly positive affective forms of feedback and more persuasive cognitive feedback forms. A unique trait for Participant 9C was the integration of messages within their idea descriptions that evolved throughout the creative ideation process.

Participant 9D initially shared three ideas that included advertising media and promotional content. While their first idea was brief, the other ideas included more details and seemed more developed:

**Original Submission**
What are some ideas your team could use to develop a public service announcement that promotes personal health and wellness?
idea 1: I think we could use a platform like Instagram to promote mental health
idea 2: I think we can organize a fundraiser at ex. the local rec centre to promote mental health. This would include teaching people about self care, what it is and why it is important. This can include face masks, healthy foods (fruits/vegetables), sleeping masks, nail polish, books, flowers, etc. All proceeds will go towards a mental health hospital/cause. This information can be spread by using virtually any platform.
idea 3: At schools, there can be a sports event (similar to jump rope for heart organization). For example this can be a combination of a track and field day (to demonstrate how movement can improve mental health), an anonymous confession booth (students will be given the opportunity to write down everything that's bothering them and stick it in a box), an arts and crafts station expressing how they feel, etc. (Participant 9D)

During Part 2 of the activity, Participant 9D received supportive feedback from both Participant 9A and 9C. Both peers also provided cognitive forms of feedback; Participant 9A through provoking question feedback, and Participant 9C through clarifying question and suggestion feedback, as shown below:

Idea 1: I agree! Almost everyone I know has Instagram so it’d be a good way to spread word. Any ideas as to how we should use Instagram? (Participant 9A)
Idea one: great idea, but in what way? Elaborate! Don't have much to go off of here. To enhance, maybe you can (Participant 9C)

This feedback seemed to impact Participant 9D’s creative ideation. In their modified submission, they elaborated on their idea as a follow up on participant 9A and 9C’s feedback, describing how Instagram could be used as a PSA medium as well as the content that would be included:

*Modified Submission*
idea 1: I think we could use a platform like Instagram to promote mental health. This can range from doing ex. a reel of things people can do to boost mental health, a video of someone day incorporating mental health hacks vs. not (to represent how small changes can make a big difference), cartoon videos reminding everyone of why mental health is important (this can capture multiple audience ages), a slide post about two people discussing the importance of mental health, aa post about how the body and mind are connected (how taking care of mental health can impact grades), etc. (Participant 9D)

The trend of cognitive feedback following affective feedback continued in peer feedback directed towards Participant 9D’s second idea. Participant 9A gave supportive feedback followed by rhetorical question feedback that indirectly addressed Participant 9A’s concern for Participant 9D’s idea to use free giveaways as a promotional tool, which Participant 9A felt might dilute the intended message of personal health and wellness:

idea 2: engaging! but is there a possibility people stop by for the products more than for the cause? (Participant 9A)

For Participant 9D’s second idea, Participant 9C also began their comments using supportive feedback, leading to suggestion feedback, recommending specific gender-based subject matter to be used in the PSA. This feedback was followed by explanation-subject matter feedback:

Idea 2: loved how you’d use something prominent in our society to get messages across! (Social media) to enhance this idea, maybe try adding in affirmations as
well! Letting people know (male and female) about how important they are! Just a thought, its may be harder to promote this type of self care event to men just because unfortunately society frowns upon them (im against this notion of what's for females and males! Men deserve to treat themselves just as much as females!) so just remember to incorporate things that’ll appeal to men as well! Maybe a relaxation night or a chill vibe night. (Participant 9C)

Peer feedback seemed to also impact Participant 9D’s refinement of their second idea. In their modified submission, Participant 9D addressed Participant 9A's rhetorical question related to free product giveaways, limiting eligibility to only registered attendees. However, there were no changes made by Participant 9D indicate that Participant 9C’s suggestion and explanation-subject matter feedback had any direct influence on Participant 9D’s modifications to idea 2:

*Modified Submission*
idea 2: I think we can organize a fundraiser at ex. the local rec centre to promote mental health. This would include teaching people about self care, what it is and why it is important. This can include face masks, healthy foods (fruits/vegetables), sleeping masks, nail polish, books, shaving kits, wellness journal, flowers, etc. To get these products the people must attend "the talk." Someone will be representing ex. a specific disease and to get a goody bag they will first have to listen to the presentation. This will help to ensure even if people are just coming for the items, they are somewhat forced to learn. Also, to avoid them coming just for items there could also be an entrance fee ticket put in place. All proceeds will go towards a mental health hospital/cause. This information can be spread by using virtually any platform. (Participant 9D)

Participants 9A and 9C continued to offer affective and cognitive feedback towards Participant 9D’s third idea. Here we see Participant 9A using supportive feedback followed by leading question feedback to direct Participant 9D towards refining their idea:

idea 3: this is nice! maybe something like Terry fox day can be integrated into this? (Participant 9A)

Participant 9C used a similar approach, instead offering clarifying question feedback:
Idea 3: loveeeee the idea! Its original! Just a thought, would they get feedback after on whatever it is they write about? Or os it just a come clean type of thing? (Participant 9C)

Participant 9D did not make any revisions or elaborate on their third idea in their modified submission. Therefore, the feedback received from participants 9A and 9C above did not trigger Participant 9D’s to further refine their third idea.

The full version of Participant 9D’s modified submission is provided below. As mentioned, most of the elaboration Participant 9D experienced likely came as a direct result of insights provided by receiving peer feedback. Participant 9D contributed to Team 9’s increase in elaboration, as the participant expanded their ideas through providing greater detail. Participant 9D also contributed a fourth idea to the team that was completely new and not connected to the feedback they received, which added to the team’s overall slight increase in fluency:

*Modified Submission*
What are some ideas your team could use to develop a public service announcement that promotes personal health and wellness?
Target audience: UTSC students
idea 1: I think we could use a platform like Instagram to promote mental health. This can range from doing ex. a reel of things people can do to boost mental health, a video of someone day incorporating mental health hacks vs. not (to represent how small changes can make a big difference), cartoon videos reminding everyone of why mental health is important (this can capture multiple audience ages), a slide post about two people discussing the importance of mental health, aa post about how the body and mind are connected (how taking care of mental health can impact grades), etc.
idea 2: I think we can organize a fundraiser at ex. the local rec centre to promote mental health. This would include teaching people about self care, what it is and why it is important. This can include face masks, healthy foods (fruits/vegetables), sleeping masks, nail polish, books, shaving kits, wellness journal, flowers, etc. To get these products the people must attend "the talk." Someone will be representing ex. a specific disease and to get a goody bag they will first have to listen to the presentation. This will help to ensure even if people are just coming for the items, they are somewhat forced to learn. Also, to avoid them coming just for items there could also be an entrance fee ticket put in place.
All proceeds will go towards a mental health hospital/cause. This information can be spread by using virtually any platform.

Idea 3: At school, there can be a sports event (similar to jump rope for heart organization). For example this can be a combination of a track and field day (to demonstrate how movement can improve mental health), an anonymous confession booth (students will be given the opportunity to write down everything that's bothering them and stick it in a box to get it off their chest), an arts and crafts station expressing how they feel, etc.

Idea 4: Bring therapy dogs to campus. This used to be done at my high school. There are programs for this. It allows students to take a few minutes to relax and unwind. Also, an animal can not judge so all you really feel is loved. Or if people don't like dogs maybe we can organize a cat cafe in the student centre. Animals are known to boost mental health. While the students are playing with the animals there can be a podcast playing in the speakers or someone can present a powerpoint. (Participant 9D)

After conducting thorough analysis of all ideas shared within Team 9 during Part 1 of the activity, I was not able to find any obvious indicators that might suggest that Participant 9D’s fourth idea was taken directly from other ideas shared within the team. However, in my analysis of peer feedback Participant 9D gave to their teammates during Part 2 of the activity, I was able to find a small clue as to what might have inspired Participant 9D to generate the new idea. An excerpt of Participant 9C’s original fourth idea is included below:

*Original Submission*
IDEA 4: ask questions on top to capture attention such as:
"Feeling burnt out?"
"Feeling Stressed?"
"Feeling unhappy"
REASSURANCE BELOW AND COPING MECHANISMS such as who to call quick affirmations (Participant 4C)

Participant 9D responded to Participant 9C’s fourth idea by offering supportive and explanation-reinforcing feedback while relating the idea by expressing their own personal experience as a student:

Idea 4: This is great and it is always important in my opinion to read information like this. As uni students it is very normal for all the above listed feelings you
have indicated to occur so it is important we learn how to deal with them. (Participant 9D)

It was therefore highly likely that the exposure to Participant 9C’s fourth idea is what led to Participant 9D’s thinking being oriented towards student health and wellness. As a result, Participant 9D may have focused their attention towards creating an all-new original idea that had not yet been thought of within the team.

**Summary of Findings for Team 9.** It can be said that peer feedback had an overall direct effect on Team 9’s creative ideation processes. Receiving peer feedback tended to drive the team’s overall increase in elaboration, most likely because of the high degree of cognitive feedback forms team members used that stimulated idea refinement in their peers. While cognitive feedback forms were commonly used in Team 9, affective forms of feedback likely influenced team members to retain many of their original ideas, which contributed to the team’s slight increase in fluency. While nearly all final ideas could be traced back to feedback received by peers, one team member (Participant 9D) generated a new idea that was not directly associated with any feedback they had received. This new idea also contributed to the team’s slight increase in fluency.

While analysis of the quantitative data collected from the perceptual survey showed that Team 9 had a high mean perceptual score ($M = 4.0$), analysis of interrater agreement within Team 9 indicated only moderate agreement between participants ($r_{WG} = 0.67$). This meant that while on average members of this team felt creative thinking was well supported through online peer assessment, not all team members felt this was the case. A breakdown of Team 9’s survey perceptual scores is shown in Table 9 below. Analysis of the data in Table 9 indicates that Participant 9D’s lower perceptual scores played a key role in Team 9’s lower level of agreement.
Table 9

Perceptual Questionnaire Scores for Team 9

<table>
<thead>
<tr>
<th></th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant 9A</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Participant 9B</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Participant 9C</td>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Participant 9D</td>
<td>2.0</td>
<td>3.0</td>
<td>2.0</td>
<td>5.0</td>
</tr>
</tbody>
</table>

Q1, "Using Online Peer Assessment was effective in supporting my team to generate a large number of project ideas."
Q2, "Using Online Peer Assessment was effective in supporting my team to generate a wide variety of project ideas"
Q3, "Using Online Peer Assessment was effective in supporting my team to develop project ideas that were interesting and unique."
Q4, "Using Online Peer Assessment was effective in supporting my team to develop detailed, high quality project ideas"

Findings from the content analysis of the qualitative interactive dataset for Team 9 provide some insight into why Participant 9D did not share the same perceptions as their teammates. While participants 9A, 9B and 9C built on their ideas after being prompted by the feedback they received, Participant 9D was the only member to share a new idea within the team. It appears that Participant 9D’s creative ideation efforts were more self-directed than the rest of the team. This may have caused Participant 9D to feel that through online peer assessment, their contributions were not matched by their peers. Moreover, unlike more direct feedback, Participant 9D’s more persuasive forms of cognitive feedback were not always addressed by their teammates. This may have led Participant 9D to perceive that online peer assessment was not able to support the full development of ideas within the team. Under such conditions, it is therefore possible that while Participant 9D may have felt that online peer assessment was effective at supporting their own creative thought, they may not have perceived it be as effectual with respect to the entire team.
Collective Case Analysis Summary of Findings. After conducting pattern analysis of the content derived from the qualitative dataset for each of the four teams described above, several generalizations were made regarding how peer feedback can influence creative ideation within teams.

First, as evidenced by all four teams, when problem identification, explanation-subject matter and in rarer cases rhetorical question feedback related to ideas themselves, feedback received by peers was likely to influence participants to remove elements of their ideas or withdraw ideas entirely. When these forms of feedback related to how ideas were articulated specifically, participants tended to make improvements to how they described their ideas to their teammates.

Second, as a pattern found in all four teams, supportive, explanation-reinforcing, and personal experience feedback provided by peers would often encourage participants to retain their ideas. In rarer cases, such as Team 5, assessors providing such forms of feedback to teammates would recognize issues with their own ideas (such as how their ideas were communicated), or in Team 4’s case, generate completely new ideas that were inspired by others.

Third, when suggestion, explanation-subject matter and in some cases leading question feedback related to elements of ideas themselves, these feedback forms would often prompt participants to make specific changes to their ideas, or in rarer cases (such as Team 4), generate completely new ideas inspired by peer suggestions. When such forms of feedback pertained to how ideas were articulated, participants would update their idea descriptions by adding or changing key words or phrases.
Fourth, when clarifying question feedback was received that required participants to respond to specific questions posed by teammates, they would often respond by describing elements that were not included in their original idea submissions.

Fifth, for most teams, when provoking question feedback was received, participants tended to respond by exploring and further developing their ideas. However, if participants also received more direct forms of feedback such as clarifying question feedback, they would often choose to respond to the more direct feedback. This may have been because direct feedback would have required less effort to respond to than more open-ended feedback forms.

Based on the above summary of findings from the collective case pattern analysis of qualitative dataset for all four selected teams, I developed a framework that describes the potential effects that forms of peer feedback can have on idea development within teams. This was named the intrateam derived effects of assessment (IDEA) framework, as seen in Table 10 below. As a compliment to this framework, a graphical representation of the potential relationships between the various forms of peer feedback and creative ideation effects for both receiver and the assessor is shown in Figure 3.

Table 10

Intrateam Derived Effects of Assessment (IDEA) Framework

<table>
<thead>
<tr>
<th>Description</th>
<th>Potential Effect(s)</th>
<th>Associated Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>When feedback exposes problems related to an idea, the receiver may</td>
<td>Removal of elements of idea by receiver</td>
<td>Problem identification</td>
</tr>
<tr>
<td>remove or adjust specific elements of their idea, or withdraw the idea</td>
<td>Idea withdrawal by receiver</td>
<td>Explanation - Subject matter</td>
</tr>
<tr>
<td>entirely</td>
<td></td>
<td>Rhetorical question</td>
</tr>
<tr>
<td>When feedback exposes problems related to several ideas, the receiver</td>
<td>Idea combining by receiver</td>
<td>Problem identification</td>
</tr>
<tr>
<td>may reduce ideas by combining them</td>
<td></td>
<td>Explanation - Subject matter</td>
</tr>
<tr>
<td>When feedback exposes problems with how an idea is articulated, the receiver may make improvements to how their idea is described/communicated to others</td>
<td>Idea communication improvements by receiver</td>
<td>Problem identification Explanation - Subject matter</td>
</tr>
<tr>
<td>When feedback reinforces an idea, the receiver may retain their idea</td>
<td>Idea retention by receiver</td>
<td>Supportive Explanation - Reinforcing Personal experience</td>
</tr>
<tr>
<td>When feedback reinforces an idea, the assessor may be inspired to improve how their ideas are communicated, or be stimulated to generate a new idea</td>
<td>Idea communication improvements by assessor New idea generation by assessor</td>
<td></td>
</tr>
<tr>
<td>When feedback suggests ways to improve an idea, the receiver may make specific changes to their idea</td>
<td>Idea refinement by receiver</td>
<td>Suggestion Explanation - Subject matter Leading question</td>
</tr>
<tr>
<td>When feedback suggests that ideas should be combined, the receiver may integrate the idea with other ideas</td>
<td>Idea combining by receiver</td>
<td>Suggestion Explanation - Subject matter</td>
</tr>
<tr>
<td>When feedback suggests ways to improve an idea, the receiver may generate a new idea related to the feedback received</td>
<td>New idea generation by receiver</td>
<td>Suggestion Explanation - Subject matter</td>
</tr>
<tr>
<td>When feedback suggests a need to better articulate an idea, the receiver may make improvements to how their idea is described/communicated to others</td>
<td>Idea communication improvements by receiver</td>
<td>Suggestion Explanation - Subject matter</td>
</tr>
<tr>
<td>When feedback related to an idea necessitates a response, the receiver may respond by describing elements of the idea that were not included in their original submission</td>
<td>Idea elaboration by receiver</td>
<td>Clarifying question</td>
</tr>
<tr>
<td>When feedback related to an idea is open-ended, the receiver may explore ways to further develop their idea, However, open-ended feedback may be ignored because it may take more effort to respond to than directive feedback</td>
<td>Idea development by receiver</td>
<td>Provoking question</td>
</tr>
</tbody>
</table>
Figure 3

Diagram of Intrateam Feedback and Creative Ideation Associations
Chapter 5

Discussion

This thesis explored student experiences related to a collaborative activity driven by peerScholar, a leading online peer assessment platform. Participant interactions were also explored to understand and describe how ideas evolved throughout an activity facilitated by online peer assessment that required group-based creative ideation. The activity was divided into four separate phases in peerScholar. Based on three research questions, an explanatory mixed methods research design was used to illuminate patterns and trends found within both the quantitative and qualitative data strands collected through peerScholar.

For the quantitative portion of the study, an interactive survey instrument based on verbal Torrance Tests for Creative Thinking (TTCT) (Torrance, 1974) was administered to 40 participants enrolled in two introduction to psychology courses at the University of Toronto Scarborough. This survey was administered to participants after they had been randomly assigned into teams of four and had completed the activity. The survey measured the degree to which participants felt online peer assessment supported their team’s fluency, flexibility, originality, and elaboration of ideas. For each team, mean scores were calculated to determine how strongly teams felt collaborative creative thinking was supported through online peer assessment, while interrater agreement (IRA) indices were calculated to determine how similarly perceptions were held amongst members of each team.

For the qualitative portion of the study, the feedback participants gave on their teammate’s ideas was coded based on modified version of Ching and Hsu’s online peer
assessment coding scheme (See Table 2). Modifications to this coding scheme included changes to naming conventions and the addition of subcategories to capture nuances found in the qualitative dataset. The originally submitted and modified ideas shared within each team after online peer assessment were then quantitatively analyzed to determine changes in fluency and elaboration. Four teams out of the 10 teams of participants were then selected for an in-depth collective case analysis of the interactive text-based qualitative dataset. Through this approach, patterns and trends in how ideas changed after the peer assessment process were described, both within and across cases. The four teams chosen for this analysis were selected based on their unique characteristics, the basis for which is described in detail in Chapter 4. Results from the quantitative and qualitative data were then combined to arrive at potential explanations of what might and might not have supported the efficacy of online peer assessment within the context of the activity.

Conclusions

Based on the findings from Chapter 4, three research questions at the heart of these thesis were answered.

(1) How do student perceptions of the effectiveness of collaborative creative thinking using online peer assessment vary between student teams?

When students were organized into teams and participated in the activity in peerScholar, average perceptions of online peer assessment’s ability to support team-based creative thinking ranged from 3.7 to 4.8 out of 5. Within most teams, mean perceptual scores were categorized as high \((M \geq 3.8)\), with only one team categorized as moderate \((M = 3.7)\). Furthermore, \(r_{WG}\) thresholds ranged from 0.67 to 0.96,
demonstrating that except for Team 7 and Team 9, within-group agreement of online peer assessment’s ability to support collaborative creative thinking was strong to very strong (Smith et al., 2014).

(2) Through online peer assessment, what kinds of feedback do team members provide on the creative ideas of their teammates?

During the peer assessment portion of the activity, participants offered affective forms of feedback (i.e., feedback that is praising or encouraging in nature) more consistently than cognitive feedback forms (i.e., feedback that is more critical in nature). Within the affective feedback provided, praise for peer ideas was more frequent than sharing personal experiences. Within the cognitive feedback provided, when participants gave critical feedback, it tended to be direct but nonabrasive, most often involving suggestions or identifying issues with either the ideas themselves or the way they were described. Less direct forms of critical feedback, such as asking persuasive or open-ended questions, were less frequently used.

(3) How does online peer assessment appear to influence the creative ideation process in teams?

Through content pattern analysis of the text-based interactive dataset, affective forms of peer feedback were seen as a common influence for participants choosing to keep their initial ideas instead of withdrawing them after peer assessment. When changes occurred between initial and final ideas, most alterations appeared to have been influenced by cognitive forms of peer feedback. In fact, most participants integrated elements of the cognitive feedback they received from their peers directly in their revised
ideas. Modifications included clarifying idea descriptions, making suggested additions or changes, combining ideas, and responding to questions.

Participants also appeared to make changes to their ideas because of exposure to the ideas of other team members, and/or potentially by the reflective process of giving feedback to peers, however, modifications influenced in these ways were less common.

Some participants also produced completely new ideas after peer assessment. New ideas may have surfaced from participants being exposed to and inspired by peer ideas. This process may have stimulated divergent thought leading to further ideation and idea generation. In other cases, new ideas appeared to have no obvious relationship with peer assessment.

In general, when peer feedback was detailed and specific, elaboration increased as ideas became more refined, but fluency decreased as some ideas merged with others or were withdrawn. This was most common when initial ideas were vague and underdeveloped, but less common when initially shared ideas were already advanced and therefore pathways for improvement potentially less obvious.

Contributions

*Contextualizing Findings in Relation to Existing Literature*

*Student Perceptions of Using Online Peer Assessment in Creative Work.*

After carrying out an open-ended task reminiscent of a class project most teams in this study had positive perceptions of online peer assessment supporting their creative thinking (see Table 4). As mentioned in Chapter 3, the activity was broken up into smaller parts with participants receiving both live and written instruction at each stage. Based on the existing literature, it is likely that this scaffolded structure played a role in
positive participant perceptions. It is known that scaffolding online peer assessment activities can help make project work more enjoyable for students (Ching and Hsu, 2013), while traditional means of peer assessment lacking an online scaffolded approach may not have a significant impact on student creative work in teams (Brill, 2016). This is further highlighted by Ostrowski et al. (2020), who suggested that student teams are best supported by using ideation tools that support a scaffolded approach to creative processes, and Dickhut (2019), who indicated that creative thinking is supported through online peer assessment because it allows students to collaborate, give and receive feedback and self-reflect on their ideas (Dickhut, 2006). Thus, this thesis aligns with existing research and emphasizes the importance of structuring ideation activities that allow students to successfully work on creative projects together.

Feedback coding frequencies (see Table 6) revealed that within the affective category, supportive feedback (i.e., expressing praise for ideas) and explanation-reinforcing feedback (i.e., justifying supportive feedback on ideas through elaboration) were most common. Of the cognitive feedback forms, suggestion (i.e., providing a method to resolve problems with ideas) was the most common, followed by problem identification (i.e., expressing issues or challenges with ideas). This feedback trend supports findings by Wuttisela et al. (2016), who discovered that when given highly structured peer assessment tasks, most students preferred giving suggestion feedback when assessing others. Furthermore, these forms of feedback tended to be more specific than other types of feedback that were more ambiguous or vague, supporting the claim that when online peer assessment exercises are more structured, peer assessment becomes more objective (Ching & Hsu, 2013).
Online Peer Assessment and Creative Thinking. In his article, *In Praise of Convergent Thinking*, Cropley (2006) discusses the link between creativity and thought. Pulling from Finke et al. (1992), Cropley posits that true creativity demands that individuals first generate novel ideas via divergent thinking then explore the novelty of those ideas through convergent thinking. Cropley (2006) suggests that without such a two-step process, creativity cannot exist. As an analogy, Cropley uses an example of an engineer who engages in divergent thinking to ideate that spaghetti could substitute for reinforcing rods, which have a similar shape. It is only through convergent thinking that the engineer recognizes that the idea violates engineering standards, and proceeds to reject the idea (Cropley, 2006). Cropley goes on to propose a seven-phase model of novelty production. In the *information* phase, an individual uses convergent thinking to become familiar with the subject of a task. In the *preparation* phase, they use convergent thinking to identify problems associated with said task. During the *incubation* and *illumination* phases, solutions arise on how to solve the identified problems through divergent thinking. Convergent and divergent thinking are then combined to test ideas during the *verification* phase, communicate, receive, and act on feedback during the *communication* phase and finally qualify ideas during the *validation* phase. Cropley’s complete seven-phase model is shown in Table 11 below.

Table 11

*Creative Processes, Traits, and Motives in the Phases of Production of Novelty (Cropley, 2006)*

<table>
<thead>
<tr>
<th>Phase</th>
<th>Action</th>
<th>Result</th>
<th>Necessary Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information</td>
<td>Perceiving</td>
<td>Initial activity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Learning</td>
<td>General knowledge</td>
<td>Convergent thinking</td>
</tr>
</tbody>
</table>
Cropley’s model provides a means of adding context to the cognitive processes that participants went through during the activity in peerScholar. Prior to beginning the activity, participants were given a briefing with instructions. This represented the *information* and *preparation* phases, anchoring participants towards convergent thinking processes as they began understanding the problem and their role in the activity. Part 1 of the activity represented the *incubation* and *illumination* phases, as participants were required to use divergent thinking to generate their ideas. Part 2 of the activity switched participants back to convergent thinking, required in order to give feedback on the ideas of their teammates. This may have also represented the *verification* phase for some participants, who were likely triggered to think critically about their own ideas while giving feedback to others. This shift in thought modality may have prepared participants for the demands of combining convergent and divergent thinking to complete Part 3 of the activity. All participants received peer feedback, and based on findings from the qualitative dataset, it can be observed that many participants did indeed retain, withdraw,
or refine their ideas by acting on feedback they received or gave (*communication* phase). At the end of Part 3 of the activity, participants then shared their final list of ideas in their modified submissions. During Part 4 of the activity, teams could review the pool final ideas and would be able to qualify which ideas to pursue (*validation* phase).

**Online Peer Assessment and Electronic Brainstorming.** When used as a means of stimulating creative thinking in groups, this thesis shows that online peer assessment can be an effective interface for team members to reciprocally share and evaluate their ideas as they engage in brainstorming activities. A key characteristic of peerScholar is the use of anonymized peer assessment, which has been shown to provide psychological safety that can lead to richer feedback towards peers (Cheng & Tsai, 2012). Every participant in this study contributed to their teams by sharing at least one idea and by giving a variety of feedback to each of their peers. Some connections may therefore be made between anonymized online peer assessment and research by Dennis & Valacich (1993), who discovered that when using electronic brainstorming, team members felt more comfortable sharing their ideas and giving feedback to others when identities remained anonymous. This is also consistent with a meta-analysis of brainstorming in higher education by Al-Samarraie and Shuhaila (2017), who found that through anonymous electronic brainstorming, students are often less apprehensive to express their thoughts relative to traditional brainstorming formats.

Further connections between online peer assessment and electronic brainstorming can be made by extending the results of this thesis to seminal theoretical frameworks. Paulus and Brown’s cognitive-social-motivation model (2017) argues that team creativity is best supported when members focus on peer ideas rather than social interactions that
can disrupt creative thinking processes. As consistent with the cognitive-social-motivation model, through peerScholar, participants in this study generated their ideas and engaged in peer assessment in isolation, and while some interactions did occur within teams, these interactions only consisted of participants giving feedback to others during the peer assessment process. Nijstad and Stroebe’s SIAM model (2006) suggests that groups ideate optimally by members brainstorming in isolation because of a reduction in production blocking. Because peerScholar allowed participants to engage in all parts of the activity at the same time, they did not need to hold their thoughts while waiting their turn to share their ideas and feedback with others. As a result, during the collaborative creative thinking activity, all participants were able to contribute freely in real-time without being hindered by production blocking effects.

Contributions to Existing Literature

Collaborative Creative Thinking in Education. This thesis enriches the current literature surrounding creativity in education in several ways. It is common for educational researchers to observe changes in creative thinking after students receive specific interventions. Much rarer however, is a focus on specific creative thinking processes students use as they participate in creative work together. For example, Chen et al. (2019) found that PjBL could enhance fluency and flexibility when students were self-directed in their creativity training and applied their knowledge in class. While Chen et al. (2019) explored the use of SCAMPER in support of project-based creative thinking within student teams, the researchers did not explore the specific interactions that took place as students arrived at their project designs. In another example, Winarno (2018) discovered that divergent thinking increased in student teams in open-ended virtual
learning environments. Winarno (2018) arrived at these findings by triangulating data from team notebooks, interviews, and project artifacts, without any examination of the interactions that took place as teams developed their creative projects.

Studies focusing on PjBL and PBL have shown that student collaborative creative thinking can be enhanced when teams are given educational tools that support their creative processes but have rarely focused on using online peer assessment as such a tool. This thesis addresses this research gap by identifying how students perceive that their creative thinking processes are supported through online peer assessment, which past research has not explored. As an example, in 2019 Wijayati et al. discovered that group conversations during project work stimulated creative thinking in students, noting that low motivation acted as a barrier for idea sharing for students who were unfamiliar with creative work and had difficulty presenting their ideas to others in group settings. Beyond group conversations, Wijayati et al. (2019) did not address alternative methods to support student creativity during project work. This thesis shows that online peer assessment has the potential to aid in facilitating the sharing and building of ideas between students, particularly during the early stages of project work where collaborative creative thinking occurs. In another example, Ersoy (2014) discovered that PBL study groups had a positive effect on creative thinking in students, suggesting that other methods of eliciting creative thinking should be explored further. This thesis responds to Ersoy’s recommendations by indicating that online peer assessment can also be an effective means of supporting group-based creative thinking when students are faced with open-ended problems. Finally, Villanueva et al. (2011) used online creative ideation tools to organize student teams, without exploring how such tools support teams after project
work had commenced. Villanueva et al. (2011) found that by using such tools for the purpose of team formation, students felt their creative thinking was supported. Therefore, this thesis fills a research gap left by Villanueva et al. (2011), who did not explore the use of tools during creative work itself.

**Online Peer Assessment.** Studies tend to concentrate on the cognitive processes involved in peer assessment, frequently focusing on formative and summative peer-to-peer or group-to-group assessments as students complete independent tasks. The feedback that students offer to their peers has no direct bearing on their own work because no direct interdependency exists between learners. As mentioned in Chapter 2, when interdependent relationships do exist, such as when students work in teams, online peer assessment researchers tend to focus exclusively on peer assessment of team member behaviours. For example, studies have focused on using behavioural-based online peer assessment to support teamwork skill development (Donia et al., 2018) and enhance team formation and student satisfaction with group work (Dumand & Galaleldin, 2020). In contrast, this thesis focuses on cognition within the context of intrateam online peer assessment research, concentrating on how online peer assessment supports the psychosocial processes connected to creative group-based activities and how students perceive online peer assessment to support these processes. As such, this thesis expands on existing literature by introducing a new stream of intrateam online peer assessment research to the field. In addition, the results of this thesis challenge existing assertions that peer anonymity leads to students offering negative and irrational peer feedback within online environments (Ching & Hsu, 2013). As shown in Chapter 4, despite full
anonymity, all feedback offered by participants was respectful and did not include any
evidence of harsh criticisms or abusive language.

**Limitations**

As with all research, this study is not without its limitations. First, because the study used purposeful non-random sampling, it cannot be assumed that results generalize to the greater postsecondary student population, which is highly diverse across a broad range of factors. For example, community college students tend to show lower persistence due to being less academically prepared, having lower levels of achievement and coming from families with lower social status than their university counterparts (Lee & Frank, 1990).

Second, the use of a questionnaire as a perceptual measurement tool may have presented limitations. The questionnaire was based on an adaptation of the verbal TTCT, using four questions designed to measure perceptions of how well online peer assessment supported creative thinking within each team. While each question measured a single constituent component of creative thinking (i.e., fluency, flexibility, originality, elaboration), the similarity of the questions may have led to rating imprecision on behalf of participants. As the same five-point Likert scale, it is possible participants may have been prone to response set. Response set occurs such that the similarity of questions may influence the tendency for participants to respond the same way for all items (Privitera & Ahlgrim-Delzell, 2019). However, because of the limited number of questions, effects set in this situation may have been limited because response set is more likely to occur when many similar questions are asked (Privitera & Ahlgrim-Delzell, 2019). A further possible limitation of the questionnaire is that online peer assessment and collaborative creative
thinking are somewhat abstract and novel assessment topics in higher education, so participants may not have had enough familiarization with them to answer the questions clearly. However, Cronbach’s alpha was in the acceptable range, indicating internal validity of the quantitative dataset, which suggests it was unlikely that the structure and subject matter of the questionnaire caused a significant limitation within the study.

Third, the influence of the research environment on participants could have created limitations for this study. Since participants knew their ideas and feedback were being recorded in peerScholar, the data collection cannot be considered unobtrusive, whereby observations “do not interfere or change a participant’s behavior” (Privitera & Ahlgrim-Delzell, 2019, p. 128). By knowing that their interactions would be captured and analyzed, participants may have been influenced by the social desirability effect. This can occur when participants act in ways perceived to be socially acceptable rather than how they might normally behave (Privitera & Ahlgrim-Delzell, 2019). As the research environment was contrived and not naturalistic, the qualitative dataset cannot be assumed to fully represent interactions that might take place in live classroom environments.

Fourth, a lack of variety of data collection methods presents another limitation. Collection of data related to student collaborative creative thinking experiences using online peer assessment was limited to the use of a numerical questionnaire and the qualitative interactive dataset. Other data collection instruments commonly used to collect attitudinal and perceptual data were not used, such as interviews or focus groups. Any presuppositions I made during the content analysis portion of this thesis were therefore limited to the qualitative dataset that was captured at the time of the study.
Fifth, the study was fully dependant on the use of peerScholar, requiring a high degree of involvement and interaction on behalf of participants. As peerScholar is fully online, students were also required to have access to the internet to participant in the study. Because data collection depended largely on participants’ ability to use and access reliable technology, this presented a lack of control over the quality of the data collection process and thus created a further limitation of this study. As stated by Tsai (2009), it is known that students with limited technical experience may face challenges adapting to new learning technologies. It is possible that some participant user experiences could have influenced the richness of the interactive dataset collected during the study. However, given that the participants did have prior experience using peerScholar in their course work and had already adopted new learning technologies due to transitioning the program online by the time of the study (as a result of the COVID pandemic context), these limitations may have been somewhat offset.

Finally, the qualitative analysis portions of this study were subject to using myself as a research instrument. While forms of feedback and patterns and trends were subject to my own interpretation, I made efforts to remain impartial and unbiased in my analysis. This included using existing evidence-based frameworks to guide my analysis, providing a personal statement outlining my personal biases, and describing the epistemological basis from which I drew my conclusions found in Chapter 3 of this thesis.

Implications for Educational Practice

Educators continue to support the needs of greater society through new methods of supporting learning and skill development for their students. This becomes increasingly important in an era where group-based creative thinking is at the centre of
nearly all innovations that help move societies forward. This thesis helps illuminate new ways that educators and stakeholders can harness existing technologies to support critical skill development in students.

Within postsecondary classrooms such as engineering, business and art and design programs where group based PjBL and PBL techniques are commonly implemented, online peer assessment could be used as an educational aid in support of student creative thinking. However, as highlighted in Chapter 3, some of the methods used to conduct this study and successfully capture data were discovered only after experiencing issues with having participants use peerScholar without supervision. Educators should be cautious about leaving students to their own devices without close direction. Applied in a creativity context, online peer assessment would likely not be best suited for fully online or asynchronous learning environments. Instead, it would be most efficacious for educators to supervise and oversee the online peer assessment process so that their students remain focused and engaged. Technical challenges that might inhibit students’ continued engagement with online peer assessment could be addressed by giving advance training on how to navigate within the architecture of online peer assessment platforms. Once students begin participating in creative-based group online peer assessment activities, educators could keep their students focused on their tasks by providing a briefing before each phase of the peer assessment process. To reduce attrition, educators could also build written or video-based instructions directly into their activities, allowing their students to access these materials once each phase is open and active.
Student “buy-in” for participating in technologically moderated learning activities such as online peer assessment could be enhanced by linking learning outcomes clearly with using online peer assessment to support collaborative creative thinking. Educators could use excerpts from Chapter 4 to teach their students ways of communicating their ideas more effectively, so they are better understood by their teammates. Students could also learn which thought modalities are required and supported during creativity based online peer assessment activities. This could include the differences between divergent and convergent thinking and how both are associated with collaborative creative ideation using online peer assessment, as supported by this thesis. After each completed phase, educators could explain the cognitive processes their students undertook, reinforcing learning outcomes as students metacognitively reflect on their own learning experiences.

Educators could also use the findings from this thesis to empower learners by teaching how feedback may influence creative ideation within their groups. To help their students understand how to give feedback on the ideas of their teammates, educators could integrate the Intrateam Creative Ideation Feedback Framework (See Table 2) in their lesson plans. Teachers could also use the IDEA Framework (See Table 10) to teach students the potential implications peer feedback can have on idea development within teams. For example, students could learn that giving direct forms of cognitive feedback, such as problem identification, suggestion, clarifying question or leading question feedback may influence their peers to make specific changes to their ideas. Furthermore, persuasive cognitive feedback such provoking question feedback may influence peers to explore their ideas further, while various forms of affective feedback would likely inspire their peers to keep their ideas instead of withdrawing them. The insights provided in
Chapter 4 could also be used for educators to emphasize the benefits of giving peer feedback. For example, students could learn that giving feedback might stimulate their own divergent thinking that could lead to them generating new ideas of their own.

Fourth, the results of this thesis support the expansion of online peer assessment in postsecondary classrooms. With increasing demand for learning technologies, institutional teaching and learning staff, who are often tasked with sourcing institutional pedagogical tools, could use the findings from this thesis to guide their efforts to support instructors. For example, suppose an instructor had formed student teams and was looking for a way to have teams finalize their project proposals. If that instructor was unaware of what options were available to them, institutional teaching and learning staff could recommend the instructor facilitate this process through a team-based activity using online peer assessment, even suggesting they model their exercise around the methods and results provided by this thesis.

There is potential for this thesis to transcend postsecondary educational environments and be applied in other institutional settings. Applications like peerScholar are often loaded with dynamic dashboards that allow users to set up activities, assign due dates, track progression, and offer feedback through all stages of the peer assessment process. This level of control would likely allow certain user groups more insights into creative ideation processes than other tools, such as electronic brainstorming. In the for-profit sector, platforms such as peerScholar could provide new opportunities for corporate training staff to teach work teams how to communicate ideas and give feedback to enhance their ideation efforts when developing projects and initiatives for new products and services. In the public sector, managers could help optimize group-based
decision making and policy development, while non-for-profit team leaders could teach their teams how to use online peer assessment to innovate to come up with new promotional campaigns and fundraising initiatives.

Finally, this thesis suggests an interesting new opportunity for developers and researchers. Specifically, it demonstrates that online peer assessment provides an excellent data collection instrument to assist researchers in exploring the processes teams work through as they engage in creative work. Yet, while the activity implemented in this thesis was made possible through peerScholar, the application’s native architecture was not designed with intrateam feedback in mind. As with most other platforms, it is more suited for peer-to-peer or team-to-team assessments. In my own experience, working around peerScholar’s standard features to support intrateam peer assessment was somewhat cumbersome and required significant time commitment to administer and test. To reduce this administrative burden, developers could use these insights to guide their development of specific features within their existing platforms that would allow setting up intrateam peer assessment to be much more intuitive and user-friendly.

**Implications for Future Research**

Future studies could explore differences in how online peer assessment supports collaborative creative thinking within specific programs, such as business, engineering, sciences, arts, and education. Sample populations could be expanded to include other universities and community colleges across Canada. Rather than using a contrived research setting, these studies could explore live educational environments where working student teams could be assigned real projects. Furthermore, while this thesis explored student experiences working in an online environment, there are opportunities
for future studies to compare results with in-person classes in order to explore potential differences in the efficacy of using online peer assessment to support collaborative creative thinking. To gather richer qualitative data, other data collection instruments could be considered, such as conducting interviews with team member participants. Finally, while this thesis did integrate the four dimensions of the verbal TTCT in the survey instrument and did focus on fluency and elaboration in the resulting qualitative analysis, future studies could explore each of the four dimensions more explicitly. For example, future research could explore the originality and flexibility of ideas as teams moved through their creative ideation processes using online peer assessment.

Beyond perceptions of online peer assessment’s use in supporting team-based creative thinking, the survey instrument used in this thesis could be expanded to include evidence-based cognitive or demographical contextual factors associated with team creativity. Such factors could include creative self-efficacy (Dampérat et al, 2016; Tierney and Farmer, 2002); team cognitive and demographic diversity (Dahlin et al., 2005; Harrison et al., 2002; Kurtzberg, 2005; Lou et al., 1996; Mannix & Neale, 2005); team leadership styles (Hu et al., 2013; Shin and Zhuo, 2003), and intrinsic motivation (Amabile, 1996).

As described by Cropley (2006), group-based creative ideation processes require a combination of both divergent and convergent thought modalities for team members to generate, critique and further develop shared ideas. While this study focuses on measuring student perceptions of creative thinking, future studies could also explore student perceptions of how well online peer assessment supports team-level convergent thinking as they engage in collaborative creative ideation activities.
This thesis explores using online peer assessment as an *assessment for learning* in support of creative thought, future research could also examine online peer assessment’s use as an *assessment of learning* tool for group-based creative work. Because creative thought by its very nature necessitates the generation of multiple solutions to problems, grading creative thinking is often seen as more challenging than traditional assessments where evaluators can easily identify singular correct answers. However, with the advent of modern assessment tools such as the Creative Thinking VALUE Rubric (Association of American Colleges and Universities, 2009), educators can grade creative thinking processes more objectively. As this thesis shows that such creative processes can be captured via platforms such as peerScholar as they occur, further studies could examine how online peer assessment could be used as a source for grading formative and summative work (i.e., the creative product) or specific procedures students use in their creations (i.e., the creative process).

There is also the potential for future research to explore the relationship between online peer assessment associated with creative work and behaviorally anchored peer evaluations. As an example, studies could compare differences between student teams that used online peer assessment to develop project concepts and teams that used more traditional approaches, such as in-person brainstorming. Specific behavioural differences that could be explored might include team member interaction, contribution and “social loafing” whereby students limit their obligations in the hopes of benefitting from the work of others (Dommeyer, 2007).

Finally, this thesis provides a basis for expanding applied research. Action research could be conducted that could help identify ways for developers to enhance their
platforms to better support intrateam online peer assessment. One such means could be for researchers to explore how educators use online peer assessment to support creative thinking and collaboration skills development for students, and what challenges and limitations they face using existing mediums. Such valuable insights could help guide advancements in cutting-edge learning technologies that help support tomorrow’s learners.

**Final Thoughts**

In conclusion, this thesis sought to investigate the efficacy of using online peer assessment to support team-based creative thinking by exploring student experiences, perceptions and processes related to a group-based creative ideation activity. By using peerScholar to facilitate interactions within teams throughout the activity, quantitative analysis of the dataset captured through peerScholar showed that participants had an overall positive experience, with most team members sharing the belief that online peer assessment supported their team’s creative thought processes. By means of a collective case study, qualitative pattern analysis of the interactive dataset was conducted to identify patterns and develop narratives for how peer feedback may have influenced the generation and development of ideas within teams. This thesis is expected to contribute not only to existing peer assessment literature, but its various findings and associated frameworks could also be used to support educators, trainers, and managers in their efforts to support student and work teams. This thesis lays the foundation for future studies that explore the relationship between team-based creative processes and intrateam feedback assisted by online peer assessment.
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Appendix A: Ethics Approval Documentation

This appendix contains the supporting documentation for ethical clearance obtained from the Queen’s University General Research Ethics Board (GREB). Copies of the clearance letter and data transfer agreement (DTA) are included, along with a copy of the complete study protocol approved by the University of Toronto Scarborough Office of Research Ethics. This protocol also includes a copy of the participant consent form. Finally, a copy of my TCPS 2: Core Certificate of Completion is included.
December 02, 2021

Mr. Scott Maybee

Queen's University

Title: “GEDCU-1080-21 EXPLORING POSTSECONDARY STUDENT EXPERIENCES USING ONLINE PEER ASSESSMENT IN SUPPORT OF COLLABORATIVE CREATIVE THINKING THROUGH TEAM-BASED CREATIVE IDEATION;” TRAQ # 6035095

Dear Mr. Maybee:

The General Research Ethics Board (GREB), by means of a delegated board review, has cleared your proposal for ethical compliance with the Tri-Council Guidelines (TCPS 2) and Queen’s ethics policies. In accordance with the Tri-Council Guidelines (Article 6.14) and Standard Operating Procedures (405), your project has been cleared for one year.

You are reminded of your obligation to submit an annual renewal form prior to the annual renewal due date (access this form at http://www.queensu.ca/traq/signon.html; click on "Events;" under "Create New Event" click on "General Research Ethics Board Annual Renewal/Closure Form for Cleared Studies"). Please note that when your research project is completed, you need to submit an Annual Renewal/Closure Form in Romeo/traq indicating that the project is 'completed' so that the file can be closed. This should be submitted at the time of completion; there is no need to wait until the annual renewal due date.

You are reminded of your obligation to advise the GREB of any adverse event(s) that occur during this one-year period (access this form at http://www.queensu.ca/traq/signon.html; click on "Events;" under "Create New Event" click on "General Research Ethics Board Adverse Event Form"). An adverse event includes, but is not limited to, a complaint, a change or unexpected event that alters the level of risk for the researcher or participants or situation that requires a substantial change in approach to a participant(s). You are also advised that all adverse events must be reported to the GREB within 48 hours.

You are also reminded that all changes that might affect human participants must be cleared by the GREB. For example, you must report changes to the level of risk, applicant characteristics, and implementation of new procedures. To submit an amendment form, access the application by at http://www.queensu.ca/traq/signon.html; click on "Events;" under "Create New Event" click on "General Research Ethics Board Request for the Amendment of Approved Studies." Once submitted, these changes will automatically be sent to the Ethics Coordinator, GREB, at University Research
DATA TRANSFER AGREEMENT

This Data Transfer Agreement (the “Agreement”) is made effective as of the final signature date below (the “Effective Date”) by and among:

THE GOVERNING COUNCIL OF THE UNIVERSITY OF TORONTO ("Disclosing Party")
With an address at: Banting Institute, 100 College Street, Suite 413, Toronto, ON M5G 1L5

Contact information:
For Disclosing Party’s Provider Investigator:
Professor Steve Joordens
University of Toronto
U of T Scarborough, Department of Psychology
1265 Military Trail, SW427A
Toronto, Ontario M1C 1A4, Canada
Phone: 416-287-7469
Email: steve.joordens@utoronto.ca

For Disclosing Party’s administration:
Tina Coccia, Director, Partnerships
Innovations & Partnerships Office
Banting Institute, 100 College Street, Suite 413
Toronto, ON M5G 1L5 Canada
Phone: 416-978-5557
Email: innovations.partnerships@utoronto.ca

-AND-

QUEEN’S UNIVERSITY AT KINGSTON ("Receiving Party")
With an address at:
Queen’s University
Fleming Hall-Jemmett Wing, 3rd Floor
78 Fifth Field Company Lane
Kingston, Ontario K7L 3N6
researchcontracts@queensu.ca

Contact information:
For Receiving Party’s Recipient Investigator:
Scott Maybee, M.Ed student under the supervision of Dr. Ben Bolden
Queen’s University
Address:
Queen’s University
Faculty of Education
Duncan McArthur Hall
511 Union Street
Kingston, Ontario K7M 5R7
Phone: 613-726-8661
Email: scott.maybee@queensu.ca

The parties wish to set out certain terms regarding transfer of Data (as defined below) that the Disclosing Party will provide to the Receiving Party for the study entitled: “Digital Brainstorming: Assessing a Digitally Supported Ideation” (the “Study”).

It is the intention of the parties that this Agreement be made in compliance with Applicable Law (as defined herein) including, if applicable, section 44(3) of the Personal Health Information Protection Act, 2004, S.O. 2004, c. 3 (“PHIPA”).

The parties hereby agree as follows:

1. Definitions. As used in this Agreement, the term:
   a) “Data” means the anonymized responses that have been collected for the purpose of the Study from the Disclosing Party’s Psy01 students in fall of 2021.

2. Compliance. The Disclosing Party shall provide the Data to the Receiving Party at no cost to the Receiving Party. In transferring the Data the parties shall comply with all applicable laws, regulations, guidelines and policies (“Applicable Law”). The Disclosing Party will prepare and furnish the Data in accordance with Applicable Law (including, if applicable, PHIPA) including without limitation obtaining all appropriate consents. The Data will not be collected and/or transferred until the Disclosing Party’s research ethics board (“REB”) and, if applicable, the Receiving Party’s REB, have: a) approved the study Protocol (as defined below); and b) approved the Study informed consent forms or waived the requirement to obtain consent. The Disclosing Party retains the right but not the obligation to conduct audits of Receiving Party’s compliance with this Agreement upon reasonable advance written notice to Receiving Party and at mutually acceptable times. If there is a breach of this Agreement by Receiving Party, Disclosing Party may require that all Data be returned promptly to Disclosing Party or destroyed in a secure manner at Disclosing Party’s option. The Disclosing Party retains the right, acting on reasonable grounds, to refuse the transfer of the Data requested hereunder.

3. Non-Disclosure of Data. The Receiving Party shall limit access to the Data only to its internal personnel, students and/or agents who need access for the purposes herein and who are bound by the same confidentiality obligations herein (“Study Staff”). Without limiting the obligation set out in s. 2, the Receiving Party agrees that they shall, and shall require their Study Staff, to:
   a) 
      i. maintain Data in confidence, and not disclose Data except as permitted by this Agreement;
   b) 
      i. use Data solely for the purposes of the Study or other expressly consented purposes, in compliance with:
         i) the Study protocol as approved by the Disclosing Party’s REB, a copy of which is attached as Schedule A, and as amended from time to time, provided that amendments are approved by the Disclosing Party’s REB (the “Protocol”);
         ii) any written conditions imposed by the Disclosing Party’s or Receiving Party’s REB as set out in Schedule B;
         iii) the Study subject’s consent consistent with the informed consent form approved by the Disclosing Party’s REB and attached hereto as Schedule C (the “Consent”) or, if the requirement to obtain consent has been waived, or otherwise determined to be unnecessary, by the Disclosing Party’s REB, the waiver of consent given by the Disclosing Party’s REB (the “Waiver”); 
         iv) any other conditions or restrictions imposed by Disclosing Party relating to the use, security, disclosure, return or disposal of the Data as set out in this Agreement.
   c) 
      i. not use the Data to identify any individuals.

TAHSN DMTA 2010
d) not transfer the Data to any third parties without the prior written consent of the Disclosing Party and without obligating such third parties to comply with the terms and conditions hereof. Notwithstanding the forgoing, the Receiving Party may transfer the Data:
   (i) to regulatory authorities, provided that the Receiving Party gives prior written notice of such intended disclosure to the Disclosing Party;
   (ii) as otherwise permitted by the Consent or Waiver; or
   (iii) in order to comply with Applicable Law or judicial process, or with a court or regulatory order, provided that the Receiving Party gives, if possible and legally permissible, prior written notice of such intended disclosure to the Disclosing Party and takes all lawful actions that are reasonable in the circumstances to minimize the extent of such disclosure and to assist the Disclosing Party to obtain confidential treatment for such disclosure.

e) upon request of the Disclosing Party following completion of the Study, securely destroy the Data as required by the Protocol, the Consent or as instructed by the Disclosing Party and provide a written confirmation of the manner of destruction in a form acceptable to Disclosing Party.

4. Safeguards and Notification. The Receiving Party shall use reasonable appropriate safeguards (including without limitation with respect to encrypting identifying numbers, linking files, storing and retrieving files from secured locations) to prevent any unauthorized use or disclosure of the Data and shall promptly report to Disclosing Party any unauthorized use or disclosure of which Receiving Party becomes aware.

5. Contact with Subjects/Individuals. The Receiving Party shall not make contact or attempt to make contact with an individual Study subject unless the Disclosing Party first obtains the individual Study subject’s consent to be contacted, except to the extent that the Receiving Party is otherwise the individual’s health information custodian.

6. Intellectual Property. Except as expressly provided herein, no right, title or interest in and to the Data is granted to the Receiving Party or implied hereunder. The Receiving Party shall own the analyzed Data that has been stripped of personally-identifying information and incorporated into its Study database and information and results arising out of analysis of the Data.

7. Publication. The Recipient Investigator and the Provider Investigator will jointly publish the results of the Study following completion of the Study at both of the Institutions. Order of authorship shall be determined in accordance with generally accepted academic standards. In the event that no joint manuscript has been submitted for publication within 18 months of completion of the Study, then Recipient may proceed to publish the Study results independently, provided that any resulting publication includes an acknowledgement of the contribution of Disclosing Party.

9. Study Documents. The following Study documents are attached hereto and/or incorporated by reference:

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<tr>
<td>Schedule B – Written Conditions of REB</td>
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<td>Schedule C – Consent or Waiver</td>
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</table>

10. General Terms and Conditions. (a) Neither party shall be entitled to assign or transfer this Agreement or the rights and obligations hereunder to any third party without the prior written approval of the other party. (b) This Agreement including the attached Schedules represents the entire understanding between or among the parties related to the Study. (c) This Agreement shall not be amended, modified, varied or supplemented except in writing signed by each of the parties. (d) No failure or delay on the part of either party hereto to
exercise any right or remedy under this Agreement shall be construed or operate as a waiver thereof. (e) The parties hereto are independent contractors. Nothing contained herein shall be deemed or construed to create between or among the parties hereto a partnership or employment or principal-agent relationship. No party shall have the authority to act on behalf of any other party or to bind another party in any manner. (f) Each party to this Agreement assumes responsibility for its own obligations under this Agreement. (g) Neither party shall use, or authorize others to use, the name, symbols, or marks of the other party hereto or its staff for any endorsement purposes without prior written approval from the party whose name, symbols or marks are to be used. (h) This Agreement shall be governed by and construed in accordance with the laws of the Province of Ontario and the federal laws of Canada applicable therein. (i) Counterparts This Agreement may be executed by way of electronic signature and in any number of counterparts with the same effect as if all parties had signed the same document. All of these counterparts will for all purposes constitute one agreement, binding on the parties, notwithstanding that all parties are not signatories to the same counterpart. An emailed PDF copy or photocopy of this Agreement executed by a party in counterpart or otherwise will constitute a properly executed, delivered and binding agreement or counterpart of the executing party (j) The term of this Agreement will commence on the Effective Date and continue and continue until the Study is completed or REB expires, whichever is earlier or subject to: (i) earlier termination by either party with thirty (30) days’ advanced notice to the other party; or (ii) extension by written agreement of the parties.
Acknowledged and agreed by:

Disclosing Party:  
The Governing Council of the University of Toronto

Name: Tina Coccia  
Title: Director, Partnerships  
Date: April 19, 2022

Receiving Party:  
Queen’s University at Kingston

Name: Jim Bunting  
Title: Assistant Vice-Principal (Partnerships & Innovation)  
Date: 05/04/2022

Read and Acknowledged by:

Provider Investigator:  
Professor Steve Joordens

Recipient Investigator:  
Professor Benjamin Bolden

Date: 05/04/2022

Scott Maybee, M.Ed student under the supervision of Dr. Ben Bolden

Date: 05/04/2022
**SCHEDULE “A”**

Study protocol as approved by the Disclosing Party’s REB

**UNIVERSITY OF TORONTO**

**OFFICE OF THE VICE-PRESIDENT, RESEARCH AND INNOVATION**

---

**Human Participant Ethics Protocol Submission**

**CONFIDENTIAL**

---

### 1 - Identification

**RIS Human Protocol Number**
41688

**Protocol Title**
Digital Brainstorming: Assessing A Digitally-Supported Ideation Process

**Protocol Type**
Investigator Submission

---

### Applicant Information

**Applicant Name**
Dr. Steve Jordon

**Rank / Position**
Professor

**Department / Faculty**
UTSC Dept. Psychology - University of Toronto

**Business Telephone**
416-287-7469

---

### Collaborators/Co-Investigators

<table>
<thead>
<tr>
<th>Name</th>
<th>Department</th>
<th>Email</th>
<th>Phone</th>
<th>Designation</th>
<th>Alt Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jennifer Chaskavich</td>
<td>UTSC Dept. Psychology</td>
<td><a href="mailto:jennifer.chaskavich@utoronto.ca">jennifer.chaskavich@utoronto.ca</a></td>
<td>(416) 287-7469</td>
<td>Alternate Contact</td>
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### Projected Project Dates

**Estimated Start Date**
29-Oct-21

**Estimated End Date**
3-Dec-21

---

### 2 - Location

**Location of the Research:**
- [x] University of Toronto
- [ ] Other Locations

---

### Other Location Details

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### Administrative Approval/Consent

Administrative Approval/Consent Needed:
- [ ] Yes
- [x] No

---

**Protocol # 2932**

Status Delegated Review App
Version: 0.002
Sub Version: 0.003
Approved On: 15-Oct-21
Expires On: 14-Oct-22

Page 1 of 9
Community Based Participatory Research Project? ☐ Yes ☑ No

Other Ethics Board Approval(s)

Another Institution or Site Involved? ☐ Yes ☑ No

3 - Agreements and Reviews

Funding

Project Funded? ☐ Yes ☑ No

Explain why no funding is required:
The PI has all funds needed to conduct this study

Agreements

Funding/funding agreement in place? ☐ Yes ☑ No

Any team member declared conflict of interest? ☐ Yes ☑ No

Reviews

☐ This research has undergone scholarly review by thesis committee, departmental review committee, peer review committee, or some other equivalent
☐ This research will go under scholarly review prior to funding
☒ This research will not go under a scholarly review

4 - Potential Conflicts

Conflict of Interest

Will researchers, research team members, or immediate family members receive any personal benefit? ☐ Yes ☑ No

Restrictions on Information

Are there any restrictions regarding access to, or disclosure of information (during or after closure)? ☐ Yes ☑ No

Researcher Relationships

Are there any pre-existing relationships between the researchers and the researched? ☑ Yes ☐ No

Relationship Description

This research project will be one of many available to PsyA31 students as a way to earn up to 4% credit in their course. When students see these projects they see the name of the PI, and thus students who look will be aware that this study is being done by their professor. It is possible this may attract or repel their participation, irrespective of the consent form this study will be made clear that participation in the study (or lack thereof) will have absolutely no impact on their class assessment and, in fact, the data will not even be examined until after the class has concluded.

Collaborative Decision Making

Is this a community-based project - i.e. a collaboration between the university and a community group? ☐ Yes ☑ No

5 - Project Details

Summary

Rationale

Protocol # 239022


OFFICE OF RESEARCH ETHICS
Ottawa, ON K0A 5B3 Canada
Tel: 1-844-494-3200 • Fax: 1-844-494-3700 • office.research@utoronto.ca • http://www.research.utoronto.ca/for-researchers/administration/ethics
Describe the purpose and rationale for the project

As highlighted by Sassenberg (2004), team-based creative thinking is an increasingly critical skill, since “human beings can often find better solutions for complex situations in collaboration than by working on their own.” (p. 295). The ability to collaborate and think creatively are soft skills that continue to remain in high demand (World Economic Forum, 2016), where organizations rely heavily on teamwork as a source of creative innovation (Barash & Paulus, 2019). As such, post-secondary educators often look for ways to foster these skills in learners, which are considered critical 21st century learning and innovation skills for students (Pacific Policy Research Center, 2010).

Online Peer Assessment (OPA) is a tool designed to have students learn by assessment to support higher order thinking skills. Research surrounding OPA has examined how it can support student creative work, most often at the level of the individual (Amphai, 2015; Chang et al., 2019; Cheng, & Tsai, 2012; Dhillon, 2006). Yet while there is extensive research exploring OPA within teams as it relates to member behaviours and performance (e.g., Donie et al., 2018; Dusman & Galea, 2020; Heslop et al., 2017), there is little study on its utilization in connection to how student teams think creatively, especially in the early stages of group projects requiring creative ideation. It is important to explore how OPA could be useful in novel ways to foster team-based creative thinking skills development in higher education so that graduates are best prepared for entering the workplace.

The intent of this study is to explore the nature of how students assigned to team projects experience creative thinking skill development as they engage in collaboration through the use of OPA. Using a sequential explanatory mixed methods design, this study aims to illustrate both common and diverging ways in which various groups of teams share, assess and modify their collective ideas using OPA. It is hoped that a greater understanding of how OPA could be used to support collaborative creative thinking skills in postsecondary learners will be gained. The proposed study is expected to add to the growing body of research surrounding OPA and creative, collaborative learning, and inspire new pedagogical approaches in higher education.

References


Methods

Describe formal/informal procedures to be used.

This research will be performed in relation to the Psy411: Introduction to Biological and Cognitive Psychology course that is now ongoing (Fall 2021). The last activity in the course is a participation-based Work Integrated Learning activity in which students will work in groups to pitch Public Service Announcement ideas. Students will learn more about the work of House of Commons and learn about the way the House of Commons works. After seeing some reports and statistics generated by HLM, and after viewing a video within which members of HLM describe their challenge (a general public task to fully understand homelessness), the students of this class will be charged with coming up with creative ways of getting the information out there. This activity allows them to take what they have learned about human attention and memory, and use it in creative ways that could have a real-world impact. (Note: Although all students will be asked to participate in this activity, the best 10 submissions will be identified (via peer assessment) and those 10 could be promoted by HLM actively and might be featured in bus stops, or on social media, etc. Students want to make this Top 10. Thus, students will know this task is coming up, and the experiment proposed here will be offered as a way in which they can each experiment (see below) while becoming prepared in advance for their final project. In a very real sense, the proposed experiment represents an opportunity to digitally transform in a new and innovative way, before coming together to work as a group on this final project.

The experiment involves a 3 step phase managed by an online Ed Tech called peerSonic. Participants will go through the experiment as groups of 4 students and will experience it as follows. In the initial Create Phase they will be given the following challenge: imagine you are part of a team that will be creating a public service announcement intended to make the general public more aware of some issue critical to the homeless population. You can use any medium (e.g., social media, radio, bus stop ad, anything and you can focus on any issue you see as critical). Before consulting with others in your group, what idea would you choose and how do you imagine it ultimately looking? That is, pitch your best draft idea as well as you can to your group mates. In the subsequent Assess Phase they will work to system again, and will see the draft ideas pitched by their three group members. The author of each idea will remain anonymous, and one by one students will be asked to read each idea from the following: Please read through this peer’s idea a pitch and then think hard about ways in which the idea might be expanded or improved. Choose at least one thing that you would want about the idea, and how do you think you would change it? So essentially provide a modified version of the pitch that includes your changes along with a separate justification for why you believe the change improves the idea. As a final step in the Assess Phase participants will be asked to rank the original ideas based on quality. Which did they think was best, second best, third best and fourth best? They will also be asked a number of other research questions as outlined in detail subsequently.

In the final Reflect Phase the participants will see the changes that peers suggested along with their justifications. The participants will be asked to rate these suggestions in terms of how much they think the changes improve. They will also be asked a number of additional questions related to the research as outlined in detail subsequently.

Participants will be expected to log in each day to complete each phase across three subsequent days. By the end of the Reflect Phase the date acquisition will be complete.

Data Analysis

Research Question 1: How do student perceptions of collaborative creative thinking using OPA vary between student teams?

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<table>
<thead>
<tr>
<th>Status</th>
<th>Version</th>
<th>Sub Version</th>
<th>Approved On</th>
<th>Expires On</th>
</tr>
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OFFICE OF RESEARCH ETHICS

McLaughlin Building, 12 Union Park Crescent West, 3rd Floor, Toronto, ON M5S 1B8 Canada
Tel: +1 416 466-2219  Fax: +1 416 466-5475  ethics.review@utoronto.ca  http://www.research.utoronto.ca/for-researchers/administration/ethics
Through analysis of survey data, it is anticipated that descriptive statistics will be used to measure internal consistency of the survey to ensure the dataset is reliable. To determine the degree to which teams perceived how well their creative thinking was supported by OPQA, total scores will be averaged based on the survey responses of each team member. A rating system will be used to classify the degree to which teams vary in their experiences.

**Research Question 2:** How much are student perceptions of collaborative creative thinking using OPQA shared within student teams?

To determine the level of agreement (i.e., shared experiences) held within teams, the intraclass agreement (ICC) and ICC-2 (1994) will be used. Calculations will be facilitated in SPSS using syntax developed by LeBreton, & Senter (2008). As is common practice in reporting of ICC, it is assumed that random response is uniformly distributed (i.e., \( \sigma^2 = 0 \)). Intra-class correlation tests will be run through SPSS to calculate ICC(1) and ICC(2) which will be measured to determine the degree to which team members' perceptions are affected by their teams, while ICC(2) will establish the degree to which the team means are reliable (LeBreton, & Senter, 2008).

**Research Question 3:** Through OPQA, what kinds of feedback do team members provide on the creative ideas of their teammates? Based on the quantitative results from the previous research questions, stratified random sampling will be used to divide teams into subgroups based on level of collaborative creative thinking and degree of team aggregation, where two teams from each subgroup will then be randomly selected for further investigation. It is anticipated that five subgroups will emerge from this process. Treating each team as a separate case, cross-case analysis will allow for the comparison of interactions within teams to discover common and diverging characteristics in how teams move through the creative ideation process in peer/School. To develop patterns, data will be coded based on a quasi-inductive approach using an OPQA feedback framework by Tseng and Tsoi (2007), consisting of the four main peer feedback categories that developed by Chi (1996): Corrective, Reinforcing, Didactic and Suggestive. Data deriving from this framework will be coded to identify emergent feedback types. Identified patterns and trends amongst the coded data will be reported that potentially explains differences and similarities in approaches to creative thinking between teams.

**Research Question 4:** Through OPQA, what patterns and trends can be observed in the interactions within student teams moving through the creative ideation process?

Coding of the initial and refined ideas shared within teams will use quasi-inductive analysis, informed by the innovation model developed by Graham & Bachmann (2004). This model incorporates a variety of different idea categories, from derivative ideas and changes, to symbiotic combining of ideas and revolutionary ideas that break away from previous thought (Graham & Bachmann, 2004). Data deriving from this framework of any will be coded to identify emergent idea types. Patterns and trends amongst the coded data will be identified that potentially explains differences and similarities in approaches to creative thinking between teams.

**References**

Chesbrough, H., &完整的内容从文档中提取。
Is there any group or individual believed to be at increased vulnerability related to the research that needs to be mitigated? (example: difficulty understanding consent, history of exploitation by researchers, or power differential between the researcher and the potential participant?)

- Yes  
- No

Recruitment

Is there recruitment of participants? 

- Yes  
- No

Recruitment details including how, from where, and by whom:

One component of grades in PSYS01 is up to 4% that can be earned by participating in ongoing departmental research. Students learn about potential studies from an online system called OpenRA. Specifically, they see descriptions of the available studies that include information about the study, the lab involved, the time commitment, and the number of credits that can be earned. They are then at liberty to choose the experiments they wish to participate in and to book participation. Note they can also choose to do an alternate written assignment to earn the grades. Given the above, our experiment will be one of those that will appear to students.

Is participant observation used? 

- Yes  
- No

Will translation materials be used required? 

- Yes  
- No

Attach copies of all recruitment posters, flyers, letters, email text, or telephone scripts.

Compensation

Will the participants receive compensation?

- Yes  
- No

Type of Compensation:

- Financial
- In-kind
- Other: Course Credit

Compensation Justification Details:
This research project will take students approximately 1 hour to complete, thus they will earn 1% towards the 4% total they can earn through research participation.

Is there a withdrawal clause in the research procedure? 

- Yes  
- No

Is compensation affected when a participant withdraws?

It will not be. Participants are free to withdraw participation at any time without consequence. They can also fully participate but, for any reason, ask for their data not to be used in any published reports of the research. No questions will be asked in such cases. The data will not be used and the student will receive full credit for participation.

7 - Investigator Experience

Investigator Experience with this type of research

Please provide a brief description of the previous experience for this type of research by the applicant, the research team, and any persons who will have direct contact with the participants. If there is no previous experience, how will the applicant and research team be prepared?

- Professor [Name] has conducted these sorts of studies on a regular basis. A number of the resulting reports are now published in peer-reviewed journals and I am asked to present the work at conferences and in webinars both nationally and internationally. Generally speaking I am viewed as a very strong educational researcher performing relevant and important work.

Protocol # 20922

Date: [Date]  
Version: 0.02  
Sub Version: 0.00

Approved On: 15-Oct-21  
Expires On: 14-Oct-22

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Are community members collecting and/or analyzing data?  Yes  No

8 - Possible Risks and Benefits

Possible Risks

Potential Risk Details:

Physical Risks  Yes  No
Psychological/emotional Risks  Yes  No
Social Risk  Yes  No
Legal Risk  Yes  No

Risk Description

The students will interact anonymously and will simply be proposing ideas or building on the ideas proposed by others. There is the chance the a participant may have trouble coming up with creative ideas, or that they may not like how others react to their ideas. Thus, there may be some discomfort and maybe some level of embarrassment. That said, students are regularly asked to do these sorts of things in classes, and to a large extent some level of discomfort is part of every learning experience. I would classify the risks of this work as incredibly low.

Potential Benefits

Benefit Description

With respect to the participant, participating in this study will allow students to "test by" ideas that may ultimately be used in a final project in the course. As such they will get a sense of what a group of other students thinks of their ideas and all of this may allow them to ultimately compose a more creative final.

9 - Consent

Consent Process Details

The first step of the process will involve students seeing and electronically signing off on a digital consent form. An example with text is attached below, the highlights of which including informing students that (a) they can withdraw at any time without penalty, (b) their participation status in this research will not be communicated to any of their professors even if the professor is a PI on the study, (c) their data will be anonymized, secured and kept confidential, and (d) should they have any concerns about the research a contact name and e-mail address - the departmental chair - will be provided.

Uploaded letter/consent form(s)

<table>
<thead>
<tr>
<th>Document Title</th>
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<tbody>
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<td>Word File</td>
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</table>

Is there additional documentation regarding consent such as screening materials, introductory letters etc.:  Yes  No

Uploaded letter/consent form(s)

Will any information collected in the screening process - prior to full informed consent to participate in the study - be retained for those who are later excluded or refuse to participate in the study?  Yes  No

Is the research taking place within a community or organization which requires formal consent be sought prior to the involvement of the individual participants?  Yes  No

Are any participants not capable (e.g., children) of giving competent consent?  Yes  No

10 - Debriefing and Dissemination

Debrief

Will deception or intentional non-disclosure be used?  Yes  No

Will a written debrief be used?  Yes  No

Written Debrief Documents
Do participants/communities have the right to withdraw their data following the debrief?  
☐ Yes  ☐ No

Withdrawal Process Details
After completing the study participants will see the text in the attached debriefing form. Below the text will be a pull down that says either "I allow my data to be used for research purposes" or "I would prefer my data not be used for research purposes." When the data is ultimately downloaded (after the term is complete) only data from those who initially consented, then re-consent on debrief, will be used.

Information Feedback Details following completion of a participants participation in the project
At this point there are no plans to present any information beyond that presented in the debriefing form.

Procedural details which allow participants to withdraw from the project
They will be informed as part of the consent process and this right will be explicitly suggested again in the context of the research debriefing (by asking them to choose whether to allow us to use the data).

☐ Not Applicable

What happens to a participants data and any known consequences related to the removal of said participant?
There will be no consequences, and the data from those who either do not consent or who ask their data NOT be used during debrief will never be downloaded. Only the data from consenting (at both consent and debrief) will be downloaded and even that data will be anonymized as a first step.

☐ Not Applicable

List reasons why a participant can not withdraw from the project (either at all or after a certain period of time):

☐ Not Applicable

11 - Confidentiality and Privacy

Confidentiality
Is the data confidential?  ☐ Yes  ☐ No
Will the confidentiality of the participants and/or informants be protected?  ☐ Yes  ☐ No

List confidentiality protection procedures
After downloading the data from consenting participants, any identifying information will be immediately replaced by participant numbers. One "key" will be retained that links identifies to numbers, and it will be used only in the very unlikely case that a participant asks that their data not be included some time after their participation. This key will be kept in secure file for 6 months, then destroyed. Otherwise all analyses will be conducted on the anonymized data.

Are there any limitations on the protection of participant confidentiality?  ☐ Yes  ☐ No

Is participant anonymity/confidentiality not applicable to this research project?  ☐ Yes  ☐ No

Data Protection
Describe how the data (including written records, video/audio recordings, artifacts and questionnaires) will be protected during the conduct of the research and subsequent dissemination of results.

All data will be digital. It will be stored in encrypted form on a secure server, and will only be de-encrypted to run analyses. This server is behind the UofT Firewall.

Explain for how long, where and what format (identifiable, de-identified) data will be retained. Provide details of their destruction and/or continued storage. Provide a justification if you intend to store identifiable data for an indefinite length of time. If regulatory requirements for data retention exists, please explain.

The non-identifiable data will be retained for as much as two years after the work is published (which itself can take 2 years or more.) Once again through, this data will be completely anonymized.

The "key" that allows one to connect identities with participant numbers will be retained for 6 months, giving participants plenty of time should they decide they wish to reverse a consent to use their data.

Will the data be shared with other researchers or users?  ☐ Yes  ☐ No
12 - Level of Risk and Research Ethics Board

Level of Risk for the Project

| Group Vulnerability | Low |
| Research Risk       | Low |
| Risk Level          | 1   |

Explanation/Justification

It primarily be asking participants to express creative ideas, and to build on the creative ideas expressed by others. This is pretty benign stuff and very much aligned with good learning experiences.

Research Ethics Board

REB Associated with this project: Social Sciences, Humanities & Education

13 - Application Documents Summary

Uploaded Documents

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<tr>
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14 - Applicant Undertaking

I confirm that I am aware of, understand, and will comply with all relevant laws governing the collection and use of personal identifiable information in research. I understand that for research involving extraction or collection of personally identifiable information, provincial, federal, and/or international laws may apply and that any apparent mishandling of said personally identifiable information must be reported to the office of research ethics.

As the Principal Investigator of the project, I confirm that I will ensure that all procedures performed in accordance with all relevant university, provincial, national, and/or international policies and regulations that govern research with human participants. I understand that if there is any significant deviation in the project as originally approved, I must submit an amendment to the Research Ethics Board for approval prior to implementing any change.

☐ I have read and agree to the above conditions
Re: Your research protocol application entitled, “Digital Brainstorming: Assessing A Digitally-Supported Ideation Process”

The Social Sciences, Humanities & Education REB has conducted a Delegated review of your application and has granted approval to the attached protocol for the period 2021-10-15 to 2022-10-14.

If this research involves face-to-face (F2F) in-person research, please note that REB approval alone is not sufficient to commence research. You must wait for an approval letter from the F2F COVID-19 Review Committee. The approval letter will be sent to the Principal Investigator’s email address once the Committee deems the F2F in-person research ready to start.

Please be reminded of the following points:

- An Amendment must be submitted to the REB for any proposed changes to the approved protocol. The amended protocol must be reviewed and approved by the REB prior to implementation of the changes.

- An annual Renewal must be submitted for ongoing research. Renewals should be submitted between 15 and 30 days prior to the current expiry date.

- A Protocol Deviation Report (PDR) should be submitted when there is any departure from the REB-approved ethics review application form that has occurred without prior approval from the REB (e.g., changes to the study procedures, consent process, data protection measures). The submission of this form does not necessarily indicate wrongdoing; however follow-up procedures may be required.

- An Adverse Events Report (AER) must be submitted when adverse or unanticipated events occur to participants in the course of the research process.

- A Protocol Completion Report (PCR) is required when research using the protocol has been completed. For ongoing research, a PCR on the protocol will be required after 7 years, (Original and 6 Renewals). A continuation of work beyond 7 years will require the creation of a new protocol.

- If your research is funded by a third party, please contact the assigned Research Funding Officer in Research Services to ensure that your funds are released.

Best wishes for the successful completion of your research.
SCHEDULE “B” – (if applicable)
Written conditions, if any, imposed by the Disclosing Party's or Receiving Party's REB

N/A
SCHEDULE “C”
Informed Consent or Waiver of Consent

Informed consent form approved by the Disclosing Party’s REB  ☐ Applicable  ☐ Not Applicable

OR:
The requirement to obtain consent has been waived, or has otherwise been determined to be unnecessary, by the Disclosing Party’s REB for the purposes of the Agreement.  ☐ Applicable  ☐ Not Applicable

Digital Brain-Storming Study
Participation Consent Form

Study Title: Digital Brainstorming: Assessing A Digitally-Supported Ideation Process

Researcher: Adam Frost, University of Toronto Scarborough, adam.frost@utoronto.ca

Supervisor: Professor Steve Joordens

Purpose and Objective of the Research:
This study will qualitatively assess participant reactions to a novel digital brain-storming process

Procedures:
You will be asked to log onto an online system across 3 consecutive days to participate in a digital brain-storming process. The topic will be the same as your final project, so this is a chance to start thinking up ideas with others. As part of this process, you will be asked to provide constructive feedback to ideas presented by your peers, and they will do the same to the ideas you present. It is possible that you might find some of their responses a little upsetting as constructive feedback often requires one to highlight things that might not be as good as they could be, and sometimes that’s not nice to hear.

Risks:
There are no significant risks associated with participation. It’s possible that you might find the experience less than exciting and, as mentioned just above, there may also be occasional instances when you react negatively to comments provided by your peers.

Compensation:
You will receive 2 credits in total for participating in this experiment. Specifically, participating in the Create and Reflect Phases are worth 0.5 credits each, and participating in the Assess Phase is worth 1 credit.

Confidentiality:
We wish to assure you that should you consent to allow us to use your data for research we will protect your privacy by only working with anonymized data and by keeping that data secure at all times. To ensure that your choice to participate or not participate has no impact on your course experience, this information will be processed
exclusively by the post-doctoral researcher. Dr. Joordens will not be informed about your choice.

The research ethics program may have confidential access to data to help ensure participant protection procedures are followed.

Right to Withdraw:
Your participation is voluntary, and you have the freedom to stop participating at any time without penalty. If you should consent to allow us to use your data, you can reverse that decision at any time before the end of the course without penalty. Once participation and data collection are complete at the end of the term, it will no longer be possible to withdraw, so if you wish to do so, please communicate your intent before the course is complete. You can communicate your request to withdraw by e-mailing Adam Frost adam.frost@mail.utoronto.ca. If you choose to withdraw from the study, all associated data collected will be immediately destroyed wherever possible.

Follow up:
At the end of the term, we will share a video with the class that describes the details of the study, and if possible, the preliminary findings.

Questions or Concerns:
If you have any questions about the research or your role in the study, you may contact the researcher Adam Frost at adam.frost@utoronto.ca.

If you have any questions about your rights as research participants, you may contact the Research Oversight and Compliance Office- Human Research Ethics Program at ethics.review@utoronto.ca or 416-946-3273.

Given all of the above, if you consent to allow us to use your anonymized data for research purposes, please sign and date below.

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If you are under the age of 18, you will require parental consent to participate in the study.

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Certificate of Completion

This document certifies that

Robert Scott Maybee

has completed the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans Course on Research Ethics (TCPS 2: CORE)

Date of Issue: 4 October, 2021
Appendix B: Instructions Provided During Creative Ideation Activity

This appendix includes copies of all instructions that were included in peerScholar for all parts of the team-based creative ideation activity, as well as instructions provided to participants prior to completing the interactive questionnaire.

Creative Ideation Activity Instructions

**PART 1: STAGE 1 (CREATE)**
Hello all, and welcome to our Digital Brainstorming study. To participate in this study we ask that you complete all phases in full. Your task will change for each phase, and we will instruct you as you move through the experiment. We really need you to complete all phases of this study, because without doing so, we won't be able to use your data! This study is essentially a role-playing simulation. You've been assigned to a virtual team of other participants. You won't ever meet, but instead you'll be interacting entirely remotely. Imagine you are working on this team to start and complete a task together. At this stage, your team needs to work towards deciding what you will be doing. This is what is called the ideation phase of brainstorming.

The experiment will be divided into two parts, with five stages in total. Here's how the digital brainstorming will work:

**Part 1:**
- **Stage 1:** You'll start out by coming up with your own ideas in isolation and sharing these ideas to your virtual team. Although they will be your own ideas, you should try orienting your thinking around what would be good ideas for your team, not just for you.
- **Stage 2:** Next, you'll get a chance to read and respond to the ideas of your team members.
- **Stage 3:** Next, you'll receive feedback on your ideas from your team. By seeing the ideas of others, giving and receiving feedback, you'll also have a chance to reflect on the entire experience to make any adjustments and/or updates to your final project ideas. This completes Part 1 of the experiment.

**Part 2:**
- **Stage 4:** You will move on to Part 2 of the experiment in peerScholar, where you will copy/paste your list of final project ideas (from stage 3) so they can be shared with your virtual team.
- **Stage 5:** Finally, you will be able to view all final project ideas shared within your team (including your own). You'll then be given a short survey regarding your team’s experience.

Ok let’s get started!

The Ontario government regularly monitors and tracks the personal health and wellness of citizens. Individual health and wellness factors include things like genetic and biological traits, personal health practices, and coping skills. Community factors include things like average household incomes, employment and education levels, as well as availability and use of emergency health-related services (Ontario Ministry of Health and Long Term Care, 2015)
Suppose the Ontario government wants your team to help improve the health and wellbeing of Ontarians. Your first task is to come up with as many different ideas as you wish that address the following challenge:

**What are some ideas your team could use to develop a public service announcement in Ontario that promotes personal health and wellness?**

This stage is all about coming up with ideas - no idea is too crazy! Just make sure to stay focused on the challenge given. Remember, you are sharing only with your team members. They will need to understand your ideas, so please try to communicate your project ideas clearly.

To stimulate creative thinking, it might be helpful to start by closing your eyes and letting your mind drift while your imagination takes over.

To help get you started, here is one example of a public service announcement on social media used to address misconceptions about OCD, which along with online quizzes and pledge forms was part of the National Alliance on Mental Illnesses StigmaFree campaign:

When you’re ready click on Let’s Go! below, then start typing your ideas using the space provided in peerScholar. To make it clear for your group mates, please separate each idea using the following format:

- Idea 1:
- Idea 2:
- Idea 3:
- Etc.
Okay, you’re ready to start ideating. Have fun!

**PART 1: STAGE 2 (ASSESS)**

Congratulations on completing Stage 1 of the digital brainstorming experiment. Your ideas were submitted to your virtual teammates!

Now it’s time to review and provide some feedback on what the other members of your virtual team came up with to address the challenge. This will provide an opportunity for you to qualify ideas shared within your team (i.e. gain a sense of how valuable each is) and to add your input and possibly build upon them.

As you read other members’ ideas, you may notice that some ideas are very similar to your own, whereas others may be completely different. Remember that each idea can influence how your Team would eventually go about solving the challenge you’ve been given, so each one is important!

It may at times feel like you’re doing this experiment alone, but rest assured, your feedback will be shared and viewed by your teammates. The length and detail of feedback you give is entirely up to you. When giving feedback, here are some things you may wish to consider:

- What do you feel each idea got right or wrong?
- What do you like or dislike about each idea?
- Do you have any suggestions on how to enhance each idea?

**PART 1: STAGE 3 (REFLECT)**

Thank you for sharing your feedback with your teammates in Phase 2 of the experiment. Now is your chance to make any changes to your final list of ideas you will submit to your virtual team!

Before you start, it may be useful to consider the feedback you received. At the same time, you may wish to reflect on some of the project ideas within your group that you reviewed and gave feedback on yourself.

You may now wish to make changes to the project ideas you originally submitted, or withdraw some ideas you feel your team should no longer consider. Perhaps there are some project ideas you wish to keep intact? If so, you may want to leave them on your list. You may also wish to add new project ideas to your list that could be brand new. You may even want to combine some of the project ideas of other group members with your own. The sky's the limit!

When you’re ready, start typing your final ideas using the space provided in peerScholar. Please separate each idea using the following format:

- **Idea 1:**
- **Idea 2:**
**Important - before you leave:** We need your help to get things set up correctly for PART 2 of the study. After submitting your revised idea list here, you will need to also submit your final list in Part 2: Stage 4 of the experiment in peerScholar. This is a critical step, so please complete and submit this phase, but **copy your revised idea list somewhere you can access later.** Then log into Part 2: Stage 4 and submit that revised idea list there as well. Thank you!

**PART 2: STAGE 4 (CREATE)**

Welcome to PART 2 of the study!

Remember that list of final project ideas you created at the end of Part 1 of the experiment? Well, it’s time to share that list with your team! Yes this is the **exact same list** you submitted in Part 1: Stage 3 (Reflect) of the study… submitting it here also will allow us to take this one step further.

To start, please **copy/paste your final list of project ideas into the space provided in peerScholar.** It should appear in the same **format** you submitted at the end of the previous activity:

| Idea 1: |
| Idea 2: |
| Idea 3: |
| Etc. |

When you’re ready, please click submit. That’s it!

**Interactive Questionnaire Instructions**

There are two sections for this final stage of the experiment:

- **Section 1 contains all the final ideas shared within your group, including your own.**
- **Section 2 contains a short questionnaire.**

Please click and read each tab to gain exposure to all final project ideas shared within your group. Unlike last time, **you will not be providing feedback directly to your group mates.**

Once you’ve reviewed all your team’s ideas including your own, head to **section 2 (Questions)** to complete the questionnaire. As you answer each question, you are free to toggle back and forth between each section. When you’re finished, please click submit.

There is no need to do the third phase of this activity. Once you submit here you are done! Thank you for participating in the study!
Appendix C: Perceptual Survey Dataset

This appendix includes the complete dataset captured during the interactive questionnaire administered to participants directly after the team-based creative ideation activity. The dataset is sorted by participant, associated team and survey question.

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