

A Conceptual Framework on Propensity to Innovate Through Virtual Team Learning among Students in Higher Education

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ABSTRACT

The increasing adoption of virtual teamwork in higher education has created a pressing need to understand how various elements of the virtual learning environment contribute to students' innovation potential. This paper develops a conceptual framework in which Virtual Team Learning (VTL), Knowledge Sharing (KS), Communication Quality (CQ), and Team Culture (TC) act as independent variables influencing students' Creative Self-Efficacy (CSE), which in turn drives their Propensity to Innovate (PI). Drawing on Social Learning Theory, the Knowledge-Based View, and Team Innovation Theory, the framework integrates these constructs to explain the mechanisms and conditions under which virtual team learning fosters innovation among students. It also offers implications for theory, educational practice, and policy to cultivate innovation-oriented learning environments.

Keywords— propensity to innovate, virtual team learning, knowledge sharing, communication quality, team culture, creative self-efficacy

INTRODUCTION

Background

The higher education sector has undergone substantial transformation in the past decade due to the COVID-19 pandemic and rapid technological advancements. Physical classroom has increasingly replaced by online platforms allowing students to collaboratively learned and engaged through virtual environments. The reform has brought forward one of the most important outcomes which is virtual learning. Virtual learning is a way for students who are apart to work together on projects, share what they know and solve problems together (Gressgard 2011). Unlike traditional classroom teams, virtual student teams collaborate across time and space using email, video conferencing, social networking platforms, and other digital tools (Chen et al., 2022).

The concept of propensity to innovate refers to readiness to explore, accept and adopt external ideas, to value the ability to think differently and possess willingness to support and invest in sometimes quite radical ideas (Klass & Wood, 2009). In the context of student learning, innovation capability is essential not only for academic success but also for employability, entrepreneurship and leadership in knowledge-driven economies (Li, Pu, & Liao, 2022; Liu et al., 2024; Huang et al., 2025). However, innovation does emerge spontaneously; it is shaped by interpersonal, cognitive and environmental factors that influence how students learn and collaborate in teams (Wang et al., 2023; Reif et al., 2024; Wiese & Burke, 2019).

Recent studies indicates that innovation in virtual environments is closely related to factors such as communication efficacy, knowledge sharing, virtual team culture and the enhancement of creative self-efficacy (Garro-Abarca et al., 2021; Li et al., 2023; Sinnemann et al., 2025; Castañeda et al., 2020). Knowledge sharing helps to integrate different perspectives into meaningful solutions, whereas effective communication ensures ideas are clearly articulated and comprehended (Castañeda et al., 2020; Montani & Staglianò, 2021; Yepes et al.,

2023). Haase et al. (2018) and Herianto et al. (2024) have defined creative self-efficacy as the psychological impetus that motivates students to persevere in problem-solving and experiment with the capabilities of their creativity. The evolution of virtual learning from a fundamental collaborative effort to a dynamic incubator of invention transpires when these components are adeptly integrated.

Research Problem

The rapid expansion of digital technology in higher education has facilitated the widespread adoption of virtual team learning as a pedagogical approach, enabling students to collaborate across cultural and geographical boundaries (Kohnke & Moorhouse, 2021). While virtual team learning offers benefits like enhanced digital skills and access to varied viewpoints, it also introduces unique challenges including diminished in-person interaction, an increased risk of miscommunication and difficulties in building trust and achieving consensus among team members (Alsharo, Gregg, & Ramirez, 2017). These challenges can profoundly hinder students' ability to engage in collaborative problem-solving and develop creative skills.

Organization innovation research has discovered several factors that support creative outcomes such as team culture, communication quality and knowledge sharing (Natu, 2022; Sudiyani, Kariyana, Sawitri, Indah, & Setini, 2020). Knowledge sharing makes it easier for people to share information and skills, which leads to new ideas. The quality of communication, on the other hand affects how clear and rich the flow of information. A team culture that encourages openness and encouragement for new ideas creates a mental space where people feel free to try new things and be creative (Jiang & Chen, 2021). However, these elements have primarily been studied within the workplace context, creating a gap in our understanding regarding their collective effects in virtual team settings within higher education sector.

Another key factor integral to innovation is creative self-efficacy that is a belief in an individual that they can produce creative outcomes. (Tierney & Farmer, 2002). Research indicates that creative self-efficacy serves as a mediator between contextual factors including leadership support and team climate, and innovative behavior (Khan & Abbas, 2022). However, there is limited understanding of the functioning of self-efficacy within student virtual teams, where members typically possess less experience, are less integrated into organizational cultures and engage in time constrained academic projects.

Due to these limitations, the impact of virtual team learning encompassing knowledge sharing, communication quality and team culture on students' creative self-efficacy remains unclear and how this, in turn shapes their willingness to innovate. Without this understanding, higher education institutions may fail to design virtual learning environments that effectively cultivate learning environments that effectively cultivate innovative competencies and skills that are not only for academic success but also for employability, entrepreneurship and leadership in knowledge-driven economies (OECD, 2021).

Purpose and Objectives

This paper aims to establish a framework describing the role of virtual team learning in enhancing students' inclination to innovate. Specifically, this paper seeks to:

1. To examine how Virtual Team Learning (VTL), Knowledge Sharing (KS), Communication Quality (CQ), and Team Culture (TC) influence students' Creative Self-Efficacy (CSE) in virtual learning environments.
2. To identify the extent to which Creative Self-efficacy mediates the interactions among VTL, KS, CQ and Students' Propensity to Innovate.
3. To develop a comprehensive conceptual framework that synthesizes VTL, KS, CQ, TC, CSE and PI, explaining the mechanisms and conditions through which virtual team learning promotes innovation among students.

Significance of the Study

This study is hoped to contribute to both theoretical and practical contributions. Theoretically the study enhances

the current literature by integrating Social Learning Theory, the Knowledge-Based view and Team Innovation Theory with students learning settings. Emphasizing innovation outcomes, the model enhances the understanding of how virtual team learning shapes the creative and problem-solving abilities of students (Nguyen et al., 2023). Practically, the paper provides guidance for educators and policymakers in designing virtual team projects that enhance students' innovation potential. With innovation increasingly recognized as a key graduate attribute, the proposed framework offers insights for higher education institutions seeking to produce graduates equipped with the skills necessary for thriving in dynamic, technology-driven environments.

THEORETICAL BACKGROUND

Social Learning Theory

Based on social learning perspective, knowledge is developed when individuals engaged in activities, receive feedback and participate in various forms of human interaction within public and social contexts (Henning, 2024). Learning and knowledge are influenced by social interactions and surroundings, as cognition is not a standalone process. Interactions are crucial for successful online learning (Garrison & Cleveland-Innes, 2005). For a student, these interactions might involve peers, educators or the subject matter itself (Hill, et al., 2009). Virtual team learning settings give students the chance to work with people from different backgrounds, which can lead to experiential learning and shared experimentation, both of which can spark new ideas.

Knowledge-Based View (KBT)

According to the Knowledge-Based View (Grant, 1996), knowledge is a critical strategic asset that leads to the formation of enterprises (or teams) that integrate and use specialized skills. According to the KBV, value generation requires information interchange, method coordination, and system alignment. Student virtual teams exemplify knowledge-driven organisations on a smaller scale. Contributors bring distinct knowledge, perspectives, and skills that, when effectively shared and integrated, can lead to innovative solutions. Properly designed virtual environments offer efficient methods for documenting, preserving, and sharing knowledge (Chen et al., 2022). As a result, the exchange of knowledge serves as the fundamental process through which learning in virtual teams enhances students' propensity to innovate (Alsharo et al., 2017). Without deliberate efforts to promote this sharing, the team's potential is not being fully realised. This theoretical perspective supports the role of information exchange as a crucial mediator within our framework.

Team Innovation Theory

Team Innovation Theory emphasises the role of team processes and climates (e.g., communication quality, support for innovation) in the development and execution of innovative ideas (Anderson, Potočnik, & Zhou, 2014). It regards innovation as a multi-stage team process that necessitates a supportive environment for idea generation, effective communication and integration of diverse inputs, and mechanisms for idea promotion and implementation. This concept further solidifies our recognition of the importance of team culture and communication quality as influential factors. In virtual student teams, the positive effects of knowledge sharing on creative self-efficacy are amplified by the reduction of uncertainty and coordination issues, which is achieved using efficient, timely, and comprehensive communication channels (Martins, Gilson, & Maynard, 2004). The likelihood of students expressing and developing innovative concepts is increased in a nurturing team environment, particularly one that is characterised by psychological safety and explicit support for creativity, which encourages risk-taking and the sharing of ideas (Gibson & Gibbs, 2006; Li et al., 2023). The mediating mechanisms (knowledge sharing and CSE) may not completely result in a heightened tendency to innovate in the absence of these moderating factors.

LITERATURE REVIEW AND PROPOSITIONS

Propensity to innovate

According to Klass & Wood, (2009), propensity to innovate refers to readiness to explore, accept and adopt external ideas, to value the ability to think differently and possess willingness to support and invest in sometimes

quite radical ideas. The author further added that propensity to innovate require risk taking without fear in areas sometimes outside the organisation's immediate field. There are various factors found to have association with innovation propensity such as innovation culture, competitive environment and innovation process. In the context of student teams, it is described as willingness to take chances, participate in creative problem-solving and put forward novel strategies (Iddris et al., 2022).

Virtual Team Learning

Virtual teams are groups of people who work together on tasks that depend on each other (Gibson & Cohen, 2023). The members are geographically separated and utilized technology-driven solutions to achieve their objectives. They extensively make use of the information and communication technologies (ICTs) to achieve this (Garro-Abarca et al., 2021). Virtual teams can accelerate product development, lessen risks associated with new prospects, increase the company's perceived scale and reduce cycle time by leveraging the pooled abilities of all members. In context of students, virtual team learning (VTL) encourages students to share their ideas, solve problems and co-create knowledge in digital environments (Matee et al., 2022). Digital settings provide potential for genuine, project-based learning; yet they also pose specific challenges such as reduced social presence, coordination difficulties and communication delays (Gibson & Gibbs, 2006). VTL exposes students to diverse perspectives, cross-cultural teamwork and practical problem-solving and ultimately enhancing their inventive talents. Recent research has shown that properly designed virtual learning environments especially in entrepreneurship education, can promote innovation and collaboration (Chen et al., 2022).

Knowledge Sharing

Knowledge sharing encompasses the dissemination of knowledge, expertise and ideas among team members. It allows pupils to bring together various perspectives, collaboratively devise solutions and improve collective intelligence (Le et al., 2024). Team members developed shared knowledge through collaborative training and problem-solving activities. Insufficiently provided information results in diminished interpersonal ties. Collaboration among team members is essential for effective knowledge integration (Pinjani & Palvia, 2013). In virtual environments, the exchange of knowledge holds significant values as it addresses the absence of physical interaction. Research indicates that fostering an environment of transparent knowledge sharing greatly enhances creative results and encourages innovative practices (Lee, Noh, & Kim, 2018; Jin, Wang, & Rao, 2022).

Communication Quality (CQ)

The need for communication is highly essential for the process of producing and developing innovation, both of which contribute to the predisposition to innovate. According to Fu (2020) communication is crucial in student environment because it enables people, groups, and organizations to recombine existing knowledge into new ideas. Communication may operate as an active sharing session between them, therefore the need for communication is very significant. Communication makes it much simpler to monitor and analyses the performance of both individual team members and the performance of the team as a whole (Valls et al., 2016). According to Anderson (2007), effective use of communication, particularly in the initial phases of team development, is equally crucial for establishing and sustaining trust. Team members must understand the importance of swiftly reporting work deliverables and providing feedback on the efforts of their colleagues. Virtual team members must become good communicators.

The success of team depends on the ability of its members to share knowledge despite the challenges poses by time and geographical limitations. Individuals in charge of virtual teams should engage with their members from the outset and set clear standards that cover not just 'what' and 'when' to communicate but also 'how' to interact effectively (Ojala, 2004). The glue that ties a virtual team together is regular communication between the team leader and each team member. Trust is very important for creating a culture of close relationships since it makes communication better.

Team culture

Team culture is the set of rules, values and behaviours that all members of a team follow. Two aspects of team

culture that are very crucial for innovation are psychological safety and support for innovation (Anderson et al., 2014). The presence of team culture, particularly in terms of psychological safety and support for innovation, facilitates an environment where students can express novel ideas without the apprehension of criticism thereby enhancing the probability of creative contributions (Gibson & Gibbs, 2006; Li et al., 2023). A culture that fosters open risk-taking and encourages students to convey new ideas without fear of judgement is a supportive environment. The advantages of learning activities are augmented by such environments, as indicated by research. For example, Gibson and Gibbs (2006) discovered that the psychological stability of the team climate can either facilitate or impede innovation, depending on the diversity present in virtual teams. In the same vein, Li et al. (2023) demonstrate that innovation performance is significantly predicted by team learning climates.

Creative Self-Efficacy

Creative self-efficacy is defined as the belief in one's capacity to produce creative results or the perceived assurance to perform a particular task creatively" (Tierney & Farmer, 2002, p. 1138). Studies show that creative self-efficacy affects how creative people are and how likely they are to take on creative challenges or face creative problems (Beghetto & Karwowski, 2017). According to Gong, Huang & Farh, (2009), creative self-efficacy is a strong predictor of individual creativity and it may have a big effect on how well a team works together and prior research have consistently recognized self-efficacy as a significant factor influencing individual innovative behaviour (Tierney & Farmer, 2002; Puente-Diaz, 2016). Engaging in VTL fosters students' creative confidence by providing constructive feedback on problem-solving and allowing them to encounter a variety of viewpoints. Individuals who possess a strong belief in their creative abilities are more inclined to seek out and achieve innovative results (Tierney & Farmer, 2002; Puente-Diaz, 2016).

CONCEPTUAL FRAMEWORK AND PROPOSITIONS

The new framework conceptualises VTL, KS, CQ, and TC as independent variables that affect students' CSE (mediator), subsequently resulting in Propensity to Innovate (DV).

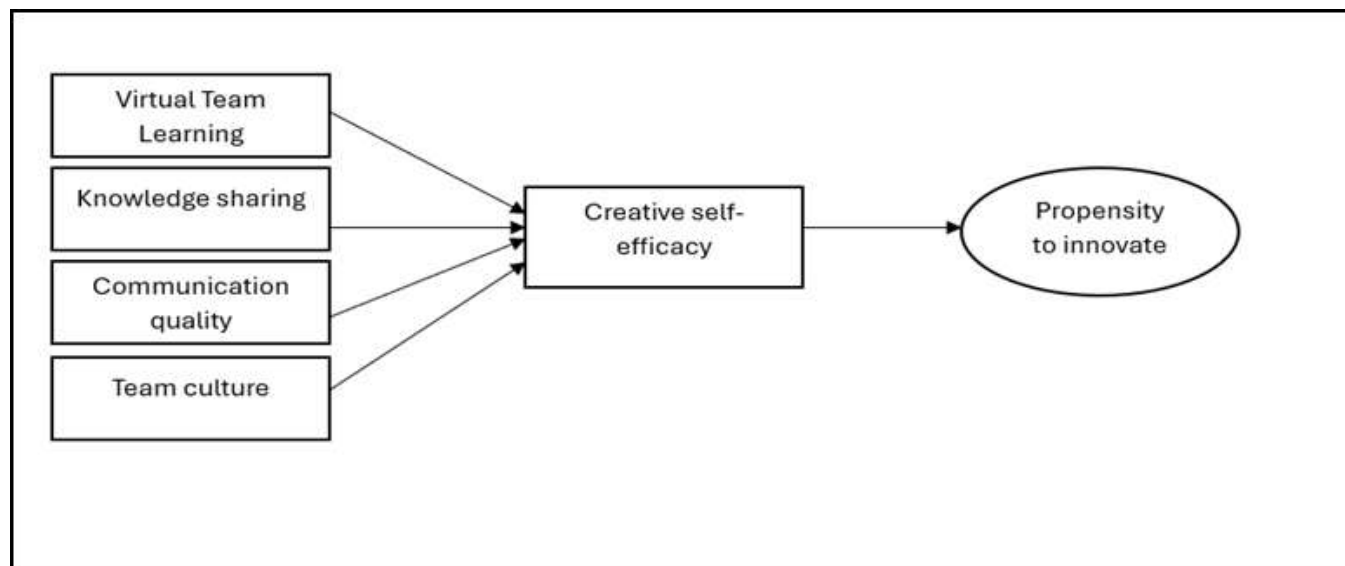


Figure 1: Conceptual Framework

Propositions:

P1: Virtual Team Learning positively influences students' Creative Self-Efficacy

P2: Knowledge Sharing positively influences students' Creative Self-Efficacy

P3: Communication Quality positively influences students' Creative Self-Efficacy

P4: Team Culture positively influences students' Creative Self-Efficacy

P5: Creative self-efficacy positively influences students' propensity to innovate

P6 (mediation): Creative Self-Efficacy mediates the relationship between VTL, KS, CQ, TC and Students' Propensity to Innovate

IMPLICATIONS

Theoretical Implications

This study expands upon Social Learning Theory, the Knowledge-Based View and team Innovation Theory within the context of student learning by highlighting Creative Self-Efficacy as the key mechanism through which various elements of the virtual environment influence innovation propensity.

Educational Practice

1. Educators ought to devise assignments that promote information exchange and introspection thereby enhancing students' creative confidence.
2. Institutions should foster collaborative digital platforms and organized peer feedback to enhance communication and cultivate a culture of creativity.
3. Students can utilize varied views in virtual teams to improve their innovative problem-solving skills.

Limitations And Future Research

As a conceptual model, empirical validation is necessary. Future research could:

1. Assess the model across diverse cultural and disciplinary frameworks
2. Examine additional mediators such as intrinsic motivation or psychological safety.
3. Conduct longitudinal research to examine the temporal development of creative self-efficacy in virtual teams.

CONCLUSION

Virtual team learning settings are ideal for encouraging students to innovate. This paper presents a conceptual framework in which knowledge sharing, communication quality, team culture promotes innovation propensity through the mediating role of creative self-efficacy. The framework provides a platform for empirical research and practical tactics for creating learning environments that encourage innovation.

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