

ORIGINAL RESEARCH: EMPIRICAL
RESEARCH - QUANTITATIVE

Moderating effects of task interdependence on interaction behaviours and creativity for nursing students on interdisciplinary teams

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Abstract

Aims: Nursing students in Taiwan often study in interdisciplinary teams that must create healthcare products. Creativity is imperative for the students' success, but studies have not explored the relational precursors to team creativity in nursing education. Therefore, the relationship was examined between task interdependence, interaction behaviours (constructive controversy, helping behaviours and spontaneous communication) and creativity for nursing students on interdisciplinary teams in Taiwan to investigate whether high task interdependence moderates the correlations between interaction behaviours and creativity.

Design: Descriptive, cross-sectional, quantitative study.

Methods: Participants were nursing students (N = 99) attending interdisciplinary capstone courses in 2- or 4-year nursing programmes at a university for science and technology in Taiwan. Self-report questionnaires were used to collect the students' demographics and perceptions of their teams' task interdependence, interaction behaviours and creativity between January 2018 and January 2019. Pearson's correlation coefficient revealed variable associations. SPSS PROCESS macro displayed moderating effects.

Results: Task interdependence had significant positive correlations with all three interaction behaviours and team creativity. Each interaction behaviour also had significant positive correlations with team creativity. High task interdependence negatively moderated the relationships between team creativity and (a) constructive controversy, and (b) spontaneous communication, but not (c) helping behaviours.

Conclusion: The empirically validated moderation model and study results suggest that nursing educators can foster creativity in their students by encouraging task interdependence and helping behaviours, and teaching students to build constructive controversy and spontaneous communication into their collaborative plans.

Impact: In Taiwan, nursing students must demonstrate creativity in interdisciplinary capstone courses. Their ability to do so requires them to cooperate with students in other disciplines who have unique skills or knowledge. This study provides insights

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into the relational factors that may improve creativity for nursing students on interdisciplinary teams.

KEYWORDS

creativity, cross-sectional study, interaction behaviours, interdisciplinary teams, moderating effect, nursing education, nursing students, Taiwan, task interdependence

1 | INTRODUCTION

As the demand for individualized, comprehensive healthcare raises worldwide, healthcare teams—not only individual professionals—are expected to deliver quality patient care and treatment. Creativity and innovation (the implementation of novel ideas) on teams are essential for both team and organizational success and for solving many of the challenges healthcare professionals encounter (Song et al., 2019). Whether employed or in training, those in nursing must learn to work creatively on teams to solve complex problems and provide the best care.

To prepare nursing students for professional careers in Taiwan, nursing educators have designed capstone programmes consisting of interdisciplinary student teams that must create innovative healthcare products. The capstone courses have demonstrably increased undergraduate nursing students' creativity (Liu et al., 2020). However, innovation-focused interdisciplinary collaboration in nursing education is still in its infancy (Ratasuk & Charoensukmongkol, 2019).

Research shows that innovation is an important goal in nursing education, and interdisciplinary collaboration is necessary for medical teams to innovate (Liu, 2020). Interdisciplinary collaboration depends on the association between teammates' *interaction behaviours* and *creativity* (Liu, 2021). Creativity on teams requires *task interdependence* (Rosen et al., 2018), or the ability of group members to interact with and depend on each other to complete their jobs (Pandey & Karve, 2020). But how task interdependence affects the interplay between interaction behaviours and creativity on teams is largely unknown.

Success of nursing students on interdisciplinary teams may depend partly on how they perceive their teammates' interaction behaviours and overall team creativity; task interdependence among team members may play a role in those perceptions. Therefore, understanding the direct and indirect relationships between task interdependence, interaction behaviours, and team creativity could benefit nursing educators and their students moving forward.

2 | BACKGROUND

2.1 | Task interdependence

A team's level of task interdependence determines its interpersonal interactions (Johnson & Johnson, 1989), participation and a sense of responsibility for others' activities (Kwon & Lee, 2020). In other words,

task interdependence sets the stage for interaction behaviours, which help teams to cooperate and communicate better (Rosen et al., 2018). According to Peng et al., (2019), team members realize that the more freely their teammates communicate and share information, the more they can each contribute to accomplishing team tasks. Therefore, when a team has high task interdependence, its members depend strongly on each other to effectively complete their work (Peng et al., 2019). Moreover, when task interdependence is high, team members cooperate more to achieve individual or team goals (Peng et al., 2019).

Without task interdependence, Lázaro et al., (2019) suggested that a team will not function properly and efficiently to complete tasks. Task interdependence is also necessary for teams to organize learning activities (Lázaro et al., 2019). Given the importance of task interdependence to team success, I sought to understand whether and to what extent a team's task interdependence may influence creativity in interdisciplinary team-based nursing education.

2.2 | Task interdependence and team creativity

According to the theory of social interdependence, two types of interdependence can determine how people interact in a situation to produce outcomes (Johnson & Johnson, 2002). Typically, positive interdependence leads to cooperative interactions and negative interdependence leads to oppositional interactions (Johnson & Johnson, 2002). Not surprisingly, a lack of interdependence leads to no interactions (Johnson & Johnson, 2002).

Task interdependence is an important part of group dynamics because it can promote team communication and cooperation, which are required for team creativity and innovation (Ratasuk & Charoensukmongkol, 2019). Teams that have high task interdependence tend to have better cooperation and share more diverse resources (Duan et al., 2019). Many studies of task interdependence and creativity on organizational teams have confirmed a positive correlation between the two variables (Saravanabawan & Long, 2014, as cited in Lázaro et al., 2019). Furthermore, Farh et al., (2015) showed that task interdependence improved motivation and organization when a team's members were more creative. The authors found that the association between task interdependence and team creativity was more positive under these conditions: (a) a high average level of member creativity, (b) high creativity demonstrated by the least creative member and (c) a low dispersion of member creativity.

Although some studies have revealed no significant association between task interdependence and creativity on teams (Dong

et al., 2017; Gong et al., 2013), more have shown that task interdependence is a defining characteristic of team cooperation (Duan et al., 2019; Farh et al., 2015; Ratasuk & Charoensukmongkol, 2019) that may improve team outcomes (Saravanabawan & Long, 2014, as cited in Lázaro et al., 2019). Importantly, most such studies have measured task interdependence in organizational contexts, but how it affects creativity on teams in nursing education settings is not well understood (Liu et al., 2021). If nursing students in capstone programmes are evaluated by their ability to work on teams with non-nursing students to create healthcare products, I sought to understand the role task interdependence plays in creativity in that context.

2.3 | Interaction behaviours and team creativity

Studies have found that interaction behaviours, including constructive controversy (e.g., Derdowski et al., 2018), helping behaviours (e.g., Moser et al., 2019) and spontaneous communication (e.g., McAlpine, 2018) correlate directly with team creativity. The first of these, constructive controversy, occurs when a team's members talk about opposing perspectives without bias, for the good of everyone (Sun et al., 2016). Constructive controversy may bolster teams' performance and improve creative outcomes (Baumeister et al., 2016; Derdowski et al., 2018) by allowing team members to build on one another's ideas and come up with creative answers together (Oedzes et al., 2019).

Helping behaviours describe team members' direct, intentional efforts to help each other with tasks that benefit the team (Dalal & Sheng, 2019). Studies have shown that helping behaviours correlate positively with team performance, commitment and interdependence (Podsakoff et al., 2014). A more recent study found that helping behaviours and team innovation were positively associated (Moser et al., 2019).

Spontaneous communication shows up as casual, impromptu interactions between team members (Liu, Wang, et al., 2020) to transfer information and generate ideas (McAlpine, 2018). Importantly, spontaneous communication allows teammates to share information in context that is useful for solving group problems (Liu, Wang, et al., 2020). As a result, spontaneous communication stimulates team creativity (Meinel et al., 2017).

Although informative, none of the studies showing positive links between interaction behaviours and team creativity was conducted with student teams in nursing education programmes. But nursing education is crucial, and team-based nursing programmes are abundant in Taiwan. Therefore, I intended this study to examine how interaction behaviours and creativity relate on teams of nursing students in interdisciplinary courses.

2.4 | Task interdependence, interaction behaviours and team creativity

Team researchers have investigated task interdependence, interaction behaviours and creativity, as well as the relationships

between any two of these variables, within teams. Although similar, task interdependence and interaction behaviours are not mutually exclusive; they are distinctive forms of cooperation that seem to feed each other. For example, task interdependence has been associated with many positive interaction behaviours, including within-group helping, cooperation and cohesion (Rico et al., 2011). As for how these similar variables affect team creativity, both task interdependence (Saravanabawan & Long, 2014, as cited in Lázaro et al., 2019) and interaction behaviours (Moser et al., 2019) may predict it.

Considerable team research has examined the direct relationships between task interdependence, interaction behaviours and creativity in groups (Derdowski et al., 2018; McAlpine, 2018; Saravanabawan & Long, 2014, as cited in Lázaro et al., 2019). However, few studies have investigated the *indirect* associations between the variables. De Jong et al., (2016) found that task interdependence positively moderated the association between trust and performance on teams. But to the best of my knowledge, no one has searched for a moderating mechanism affecting the associations among task interdependence, interaction behaviours and creativity on teams in nursing education. Therefore, this study examined the potential for high task interdependence to moderate the correlations between interaction behaviours and creativity on nursing student teams in interdisciplinary programmes.

2.5 | Hypotheses and hypothesized model

Informed by the literature review, four hypotheses guided this study, as follows: On nursing student teams: (a) task interdependence and creativity will be positively correlated; (b) task interdependence will correlate positively with each interaction behaviour; (c) creativity will correlate positively with each interaction behaviour and (d) high task interdependence will have a positive moderating effect on the associations between each interaction behaviour and creativity. The results could (a) help nursing students in interdisciplinary team-based capstone courses become more creative and (b) augment the literature on task interdependence and team creativity in nursing education. Figure 1 shows the conceptual model informing this study.

3 | THE STUDY

3.1 | Aims

The objectives of this study were to: (a) identify correlations among task interdependence, interaction behaviours and creativity on interdisciplinary teams according to nursing students and (b) look for potential moderating effects of high task interdependence on the associations between interaction behaviours and creativity on those teams.

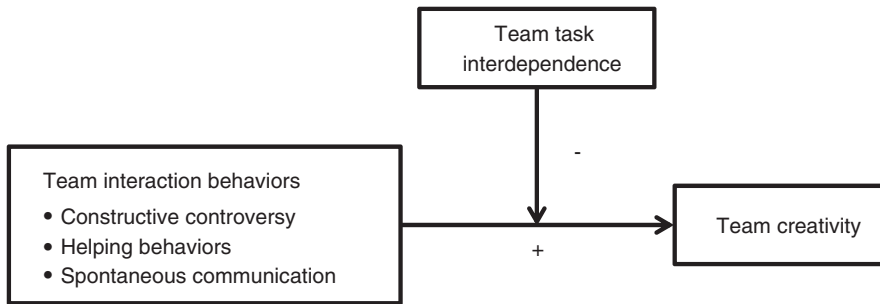


FIGURE 1 Hypothesized moderation model

3.2 | Design

I conducted a descriptive cross-sectional, quantitative study to process results quickly, reduce experimental costs and directly observe phenomena arising from the data (Spector, 2019).

3.3 | Participants

Inclusion criteria for participation in the study were nursing students attending either of two interdisciplinary capstone courses in 2- or 4-year nursing programmes at a university for science and technology in northern Taiwan. Otherwise, no exclusions applied: any student who gave written informed consent could take part. With G*Power, I calculated the minimum required sample with a 95% confidence interval, an alpha-type error less than 0.05, three predictor variables and a power of test of 0.8. Consequently, the first minimum required sample was 52 participants (Faul et al., 2007). After assuming a 20% attrition rate for repeated measures, the final minimum required sample was 63.

3.4 | Instruments

One questionnaire collected participants' demographics (age, gender), programme type (2-year or 4-year) and course satisfaction (along a Likert scale of 1 = strongly disagree to 5 = strongly agree). Three self-report questionnaires were scaled instruments asking for participants to rate their teams' task interdependence, interaction behaviours and creativity. Table 1 shows sample statements from the instruments, each described and measured as follows:

To measure team task interdependence, I adapted an existing instrument (Chen & Tjosvold, 2002; Katz-Navon & Erez, 2005) and its Chinese version (Yang et al., 2010). See Section, 3.5, for details of the translation process. The participants scored each of the six survey items on a 5-point Likert scale of 1 = strongly disagree to 5 = strongly agree. The mean of the scores was the total score. A higher total score suggested more task interdependence. The original Chinese instrument (Yang et al., 2010) had a Cronbach's alpha coefficient of 0.71, and the instrument adapted for this study was 0.78 indicating adequate reliability. Satisfactory validity was proven by factor analysis.

To measure team interaction behaviours, I adapted original instruments by Bond and Ng (2004) and Ng and Van Dyne (2005) and a Chinese version translated by Yang et al., (2010). See Section, 3.5, for details of the translation process. The 24-item instrument comprised 4 items to rate constructive controversy (Harris Bond & Wing-Chun Ng, 2004; Yang et al., 2010), 10 items to rate helping behaviours (Ng & Van Dyne, 2005; Yang et al., 2010) and 10 items to rate spontaneous communication (Yang et al., 2010). Participants scored each item on a 5-point Likert scale of 1 = strongly disagree to 5 = strongly agree. The mean of item scores for each interaction behaviour was its total. Higher total interaction behaviour scores suggested a greater degree of their presence. The original instruments for the three interaction behaviours had Cronbach's alpha coefficients ranging from 0.75 to 0.95 (Yang et al., 2010). The instruments for this study had Cronbach's alphas ranging from 0.87 to 0.94, signifying good reliability. Factor analysis displayed good validity.

To measure team creativity, I adapted an instrument first developed by Farh et al., (2010) and its Chinese version (Yang et al., 2010), which has also appeared in other studies (Li et al., 2018; Ma et al., 2017). See Section, 3.5 for details of the translation process. The questionnaire included 10 items to rate team creativity, each scored on a 5-point Likert scale of 1 = strongly disagree to 5 = strongly agree. The mean of the item scores was the total score. A higher total score suggested a greater level of team creativity. Team creativity instruments used in previous studies had Cronbach's alpha coefficients ranging from 0.86 to 0.95. The Cronbach's alpha coefficient for the instrument in this study was 0.94, demonstrating good reliability. Factor analysis evinced satisfactory validity.

3.5 | Validity, reliability and rigour

I used Taiwanese translations of the instruments measuring team task interdependence, interaction behaviours and creativity. Each instrument was assessed for face validity and content validity, and has strong reliability, based on the Cronbach's alphas ranging from 0.71 to 0.95 (Yang et al., 2010). The Taiwanese versions of each instrument have been validated in several recent studies of nursing students in Taiwan (Liu, 2020; Liu et al., 2021; Liu, Wang, et al., 2020). In this study, the Cronbach's alphas for the subscales ranged from 0.78 to 0.94.

TABLE 1 Sample items from the instruments used to measure nursing students' perceived team task interdependence (TTI), team interaction behaviours (TIB) and team creativity (TCr)

Component	Item
TTI	During the capstone course team activities:
	1. Team members must make efforts together. 2. Team members work independently.
TIB	During the capstone course team activities:
	1. Team members can propose their own ideas, even if those ideas are different or others do not agree with them. 2. Team members can understand key points of problems immediately and summarize everyone's point of view.
Helping behaviors	1. Team members can initiate help to supplement or explain when fellow team members cannot express ideas completely. 2. Team members help each other understand other team members' opinions or ideas.
	1. Team members spontaneously use different kinds of communication channels to collect different kinds of information and data about new products. 2. Team members spontaneously develop new products/services by using different kinds of information, imparting knowledge and skills and discussing privately during spare time.
TCr	During the capstone course team activities:
	1. Team members can distinguish possibilities of new products or new methods. 2. Team members often develop new products or services that are unique.

3.6 | Procedure

Before collecting data, I obtained ethics approval from the hospital ethics committees' Institutional Review Board (IRB: 201800212B0). As the nursing capstone course concluded, a trained instructor described the study, its purpose and procedures to the nursing students in class. The faculty member handed out packets carrying a narrative of the study and its aims, an informed consent page and self-report instruments asking for the participants' age, gender, programme type and course satisfaction, and perceived task interdependence, interaction behaviours and creativity on their teams during the semester. Interested participants filled out the questionnaires independently in class. The informed consent pages ensured the participants' answers were confidential and that they were free to withdraw from the study any time before submitting their packets. Faculty instructed the students to complete the packet contents in the classroom and then returned them to my office. The packets were coded with numerical identifiers to ensure anonymity.

Both capstone courses were 18 weeks long and consisted of multiple interdisciplinary teams. They were instructed by faculty from schools of nursing and design at two universities. The design students attended a class called 'Medical Product Design' at different university from the nursing students. One capstone course ('Course 1') consisted of 69 students (48 in nursing and 21 in design), split into six teams. Each of the teams had eight nursing students and three or four design students, all of whom were grouped randomly. The second course ('Course 2') had 67 students (51 in nursing and 16 in design), split into 10 teams. Each team had five or six nursing students and one or two design students, all of whom were randomly grouped. Both courses were led by three instructors of nursing and two instructors of design.

The courses consisted of lectures and periodic group (team) discussions that prepared the students to collaboratively create patentable healthcare products. The interdisciplinary nature of the capstone courses helped the nursing students work and think creatively by exposing them to differing perspectives from their teammates and instructors in design. Such diversity created opportunities for conflict resolution and resourcefulness. The courses included four workshops requiring either in-person or remote collaboration. The nursing students in Course 1 and the design students on their team attended the workshops remotely. All nursing and design students in Course 2 attended the workshops in person.

The lectures taught the students to search for patents, develop healthcare products and assess market needs by analysing feasibility, testing products and marketing. They also encouraged brainstorming to help the students learn how to apply divergent (exploratory) and convergent (focused) thinking. In the workshops, the student teams shared and discussed diverse thoughts and perspectives about what defines marketable healthcare products. Examples of products that teams in the capstone programme have developed include a user-friendly urination device for women and an automated intravenous injection controller. Each team began to develop a healthcare product and presented their progress at midterm. Each team demonstrated its final product at the course's end. Until the very end of their courses, the nursing students were unaware of this study.

3.7 | Data collection and analysis

I collected data from two courses: one began in January 2018 and the other ended in January 2019. I used SPSS version 20.0 to analyse the data. I used descriptive statistics to evaluate participants'

demographic characteristics and perceptions of task interdependence, interaction behaviours and team creativity. I computed the inter-team-member agreement (R_{wg}) among the individual scores (Kipkosgei et al., 2020), which ensured that aggregating the scores as team-level measurements was appropriate.

I calculated Pearson's correlation coefficients for team-level task interdependence, interaction behaviours and creativity. I used regression analysis to detect moderating effects, but first I subtracted the original scores from the mean (mean centering) to bypass multicollinearity. Next, I grouped the participants as having high task interdependence (HTI) or low task interdependence (LTI). The HTI group included those whose mean score on the task interdependence instrument was above the median; the rest were grouped as LTI. I aggregated the task interdependence scores for students in the HTI group. Then, I applied the SPSS PROCESS macro to each of three models (Hayes & Scharkow, 2013) to regress total team-level creativity on: (a) the HTI group's total task interdependence score; (b) the

three interaction behaviours (one per model) and (c) each behaviour's interaction with the HTI group's task interdependence score.

4 | RESULTS

4.1 | Demographics and mean instrument scores

Of the 111 nursing students who received survey packets, 99 (89.2%) completed the instruments and signed consent forms. The participants ranged from 21 to 23 years old ($M = 22.4$; $SD = 0.50$), and nearly all (96%) were female (Table 2). About half of the participants were enrolled in 4-year programmes with the other half in 2-year programmes. The majority (about 75.8%) of students were satisfied with the capstone course (Mean = 4 [$SD = 0.6$]).

The median R_{wg} value was 0.93 for task interdependence, 0.92 for interaction behaviours, and 0.86 for team creativity. All were greater than 0.8, indicating that data aggregation was valid for reporting findings at the team level (Liao et al., 2010). Accordingly, mean scores represented the teams' task interdependence, interaction behaviours and creativity. The aggregated mean task interdependence score was 4.16 ($SD = 0.56$; Table 2). Forty-seven participants were in the high task interdependence (HTI) group and 52 were in the LTI group. Mean aggregated interaction behaviour scores, from highest to lowest, were as follows: helping behaviours = 4.20 ($SD = 0.64$), constructive controversy = 4.18 ($SD = 0.69$) and spontaneous communication = 4.11 ($SD = 0.62$). The mean aggregated team creativity score was 4.14 ($SD = 0.62$). These results suggest that the nursing students rated task interdependence, interaction behaviours and creativity on their interdisciplinary teams as moderately high.

4.2 | Correlations among teams' task interdependence, interaction behaviours and creativity

Table 3 shows Pearson's correlation analysis for relationships among team-level task interdependence, interaction behaviours and team creativity. Using Draper's method (2020), I found that task interdependence was positively correlated ($p < 0.01$) with constructive controversy ($r = 0.714$), helping behaviours ($r = 0.803$) and spontaneous

TABLE 2 Descriptive statistics of total sample ($N = 99$) and aggregated team-level scores (means) on each of the scaled instruments

Variable	Range/n (%)	Mean (SD)
Age	21-23	22.4 (0.50)
Gender		
Male	4 (4%)	
Female	95 (96%)	
Program type		
2-year	51 (51.5%)	
4-year	48 (48.5%)	
Course satisfaction	1-5	4 (0.60)
TTI score	1-5	4.16 (0.56)
TIB		
CC score	1-5	4.18 (0.69)
HB score	1-5	4.20 (0.64)
SC score	1-5	4.11 (0.62)
TCr score	1-5	4.14 (0.62)

Abbreviations: CC, constructive controversy; HB, helping behaviours; SC, spontaneous communication; TCr, team creativity; TIB, team interaction behaviours; TTI, team task interdependence.

Variables	TTI	TIB			TCr
		CC	HB	SC	
Team task interdependence (TTI)	-				
Team interaction behaviours (TIB)					
Constructive controversy (CC)	0.714**	-			
Helping behaviours (HB)	0.803**	0.810**	-		
Spontaneous Communication (SC)	0.827**	0.760**	0.842**	-	
Team Creativity (TCr)	0.826**	0.736**	0.821**	0.861**	-

** $p < 0.01$.

TABLE 3 Correlations among aggregated team-level scores for task interdependence, interaction behaviours and creativity ($N = 99$)

communication ($r = 0.827$). Task interdependence was also positively correlated with creativity ($r = 0.826$; $p < 0.01$). Creativity was positively correlated ($p < 0.01$) with constructive controversy ($r = 0.736$), helping behaviours ($r = 0.821$) and spontaneous communication ($r = 0.861$). Overall, all tested variables had significantly positive correlations with one another (Table 3).

4.3 | Moderation analysis

Table 4 shows the moderation models. Model 1 showed a significant negative interaction between high task interdependence (HTI) and constructive controversy ($\beta = -0.50$; 95% CI = $[-0.92, -0.08]$; $p < 0.05$). Model 2 showed no significant interaction between HTI and helping behaviours ($\beta = -0.16$; 95% CI = $[-0.77, 0.44]$; $p = 0.589$). Model 3 (Table 4) showed a significant negative interaction between HTI and spontaneous communication ($\beta = -0.40$; 95% CI = $[-0.79, -0.01]$; $p < 0.05$).

Overall, high task interdependence negatively moderated the positive relationships between team creativity and (a) constructive controversy, and (b) spontaneous communication, but it had no effect on (c) helping behaviours (Figure 2).

5 | DISCUSSION

This study explored the relationships among task interdependence, interaction behaviours and creativity as reported by nursing students on interdisciplinary teams in Taiwan. Task interdependence exists when teammates associate with and rely on each other to accomplish their objectives (Pandey & Karve, 2020). The fairly high task interdependence among nursing students in this study may reflect the success of faculty in teaching the teams how to brainstorm, negotiate ideas and create useful healthcare products together. The strong direct correlation between task interdependence and creativity on teams supported my first hypothesis and findings by Saravanabawan and Long (2014, as cited in Lázaro et al., 2019). However, others have reported no significant association between the two variables.

Namely, Dong et al., (2017) found no positive association between task interdependence and creativity on teams with a significance level of $p = 0.05$, but they did find one at the $p = 0.10$ level. Gong et al., (2013) found no association between the two variables. Perhaps the participants in those studies had less instruction than the students in this study for developing cooperative skills, exchanging knowledge (Dong et al., 2017) or producing creative outcomes (e.g., Li et al., 2018). Nonetheless, this study's outcome suggests that when the nursing students collectively depended on each other to complete tasks, their teams achieved creative success.

Task interdependence also went hand in hand with each of the three interaction behaviours, confirming hypothesis 2 and other studies (Chen et al., 2009; De Jong et al., 2007; Rico et al., 2011). The strong positive correlations across these measures suggest that

TABLE 4 Regression analysis parameters examining potential moderating effects of high team task interdependence on the relationships between each interaction behaviour (one per model) and total team creativity score

Model 1	Model 2			Model 3			
	Variable	β	SE	Variable	β	SE	
HTI (centred)	1.40***	0.23	[0.94, 1.86]	HTI (centred)	0.92**	0.31	[0.29, 1.5]
CC (centred)	1.05**	0.28	[0.49, 1.62]	HB (centred)	0.77*	0.35	[0.06, 1.48]
HTI x CC	-0.50*	0.21	[-0.92, -0.08]	HTI x HB	-0.16	0.30	[-0.77, 0.44]
				HTI x SC	-0.40*	0.19	[-0.79, -0.01]

Abbreviation: HTI, High team task interdependence; CC, Constructive controversy; HB, Helping behaviours; SC, Spontaneous communication; β , Standardized beta coefficients; SE, Standard error; Independent variable, Total interaction behaviour score (one per model); Dependent variable, Total team creativity score.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

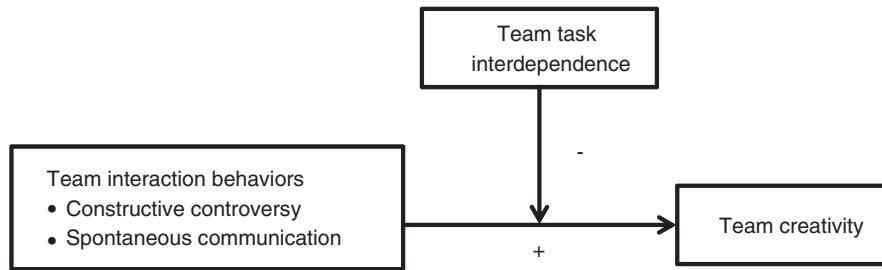


FIGURE 2 Validated moderation model

task interdependence may influence behavioural integration, encouraging teammates to not only engage in constructive discourse, help each other and communicate spontaneously, but also to depend on one another to do so (Pandey & Karve, 2020). Cooperative behaviour is more common on teams with high task interdependence (Zhang & Kwan, 2019), which suggests the faculty had successfully imparted collaborative skills on their students.

Finally, each of the interaction behaviours had a strong direct relationship with creativity on teams, which is consistent with hypothesis 3, Baumeister et al., (2016) and Derdowski et al., (2018). Constructive controversy may have helped the students exchange credible alternative views that, when accepted by team members, could have helped the teams generate more creative solutions, strategies and ideas (Liu, 2020). Helping behaviours may have promoted team creativity by allowing the students to turn cooperative challenges, such as idea diversity, into resources for innovation (Moser et al., 2019). Spontaneous communication may have created opportunities for the teams to generate ideas (McAlpine, 2018) and novel solutions, and resolve conflicts together to make room for creativity (Liu, Wang, et al., 2020).

The individuals on teams that display high task interdependence rely on each other more to interact and collaborate (Peng et al., 2019; Ratasuk & Charoensukmongkol, 2019; Rosen et al., 2018). I had thus hypothesized that the cooperative aspect of high task interdependence would reinforce the positive impact of interaction behaviours on team creativity. However, on the teams in this study, high task interdependence *negatively* moderated the positive relationships between creativity and (a) constructive controversy, and (b) spontaneous communication, and had no effect on helping behaviours.

Task interdependence denotes cooperation and being able to count on (know what to expect from) teammates. In contrast, constructive controversy includes a measure of conflict, and spontaneous communication occurs outside of what is expected. Therefore, team members who depended on each other a great deal to finish tasks may have naturally dampened any behaviours rooted in conflict and spontaneity, thus reducing the strength of those behaviours' impact on creativity (Liu, Wang, et al., 2020). Therefore, to help highly cooperative teams benefit from constructive controversy and spontaneous communication, nursing educators could try teaching them to value and incorporate those skills in a structured, collaborative way (Liu, 2020; Liu et al., 2021). Perhaps building constructive spontaneous discourse and conflict into the programme, turning them into something positive and expected, would facilitate

the benefits these interaction behaviours can bring to team creativity. The validated moderation model is in Figure 2.

To my initial surprise, high task interdependence did not affect the relationship between the teams' helping behaviours and creativity. However, helping behaviours and task interdependence are both inherently cooperative, decisive acts of collaborating to accomplish shared objectives (Dalal & Sheng, 2019; Rico et al., 2011). Perhaps the cooperative element in each variable was similar enough that on teams with high task interdependence, helping behaviours were indistinguishable. High task interdependence would therefore not have affected the helping behaviours' impact on team creativity. Nonetheless, in these capstone courses, the nursing students need the design students' expertise to create healthcare products, so cooperation is key (Liu et al., 2021). Therefore, with cooperation and team creativity as primary goals, nursing educators may benefit their students by teaching and encouraging both task interdependence and helping behaviours.

5.1 | Limitations

The cross-sectional design of this study inhibits me from drawing causal relationships between task interdependence, interaction behaviours and creativity on interdisciplinary teams in nursing education courses. I assessed data from nursing students on such teams at only one university in Taiwan, which reduces the potential for applying or generalizing the findings to students in other healthcare education programmes or settings in Taiwan or beyond. I also analysed each variable according to the nursing students' self-reported perceptions, which do not necessarily reflect objective reality. Future studies could increase objectivity by including the instructors' perceptions of teams' task interdependence and interaction behaviours, final project grades and faculty-scored standardized evaluations of team creativity.

6 | CONCLUSION

In this study of nursing students on interdisciplinary teams, task interdependence, three interaction behaviours and creativity were all positively correlated with one another. High task interdependence negatively moderated the relationships between team creativity and (a) constructive controversy, and (b) spontaneous communication,

but it had no effect on (c) helping behaviours. This study's validated moderation model (Table 4, Figure 2) can guide nursing educators to improve creative outcomes on nursing student teams. The validated model and the positive correlations between all studied variables suggest that nursing educators should: (a) teach and encourage the cooperative skills of task interdependence (reliance on one another) and helping behaviours, and (b) teach students to build constructive controversy and spontaneous communication into their cooperative structures. Following these steps may maximize the potential for task interdependence and interaction behaviours to improve the creative outcomes of nursing students in interdisciplinary capstone courses. Finally, this study can help educators prepare nursing students for effective professional teamwork while developing beneficial healthcare products.

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CONFLICT OF INTEREST

The author declares no conflicts of interest.

AUTHOR CONTRIBUTIONS

All authors have agreed on the final version and meet at least one of the following criteria (recommended by the ICMJE*):

- substantial contribution to conception and design, acquisition of data or analysis and interpretation of data,
- drafting the article or revising it critically for importance intellectual content.

PEER REVIEW

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