Effectiveness of Student Teams: The Role of Team Personality Diversity

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Abstract: In current educational landscapes, group work has emerged as a cornerstone of pedagogical strategies, offering students opportunities to cultivate essential skills for future professional endeavors. Central to the success of collaborative efforts lies the intricate interplay of team dynamics, with team personality diversity emerging as a significant factor influencing team effectiveness. Building upon existing research highlighting the critical role of team personality in driving team effectiveness (Kozlowski and Bell, 2003), this study delves into the nuanced relationship between team personality diversity, team processes and emergent states, and collaborative outcomes within student teams. Acknowledging the multifaceted nature of team dynamics, this research adopts a comprehensive approach, drawing upon established theoretical frameworks, such as the input-process-output model (Hackman, 1987; Ilgen et al, 2005), to elucidate the mechanisms through which team personality diversity influences team effectiveness. Through a thoroughly designed two-wave methodology and a group-level analytical approach, data were collected from 57 student teams enrolled in undergraduate and graduate courses across diverse academic disciplines during semester 2 of 2022/2023. Our findings reveal that emotional stability diversity within teams exerts a significant yet indirect influence on team satisfaction through its impact on communication openness. Specifically, greater emotional stability diversity leads to diminished communication openness, subsequently leading to reduced levels of team satisfaction. This intricate chain of effects underscores the importance of managing team personality diversity to foster open communication and ultimately enhance satisfaction among team members. While our results align with established theoretical underpinnings, they also prompt critical reflections on team interdependence and the duration of collaborative engagements within academic settings. Consequently, we advocate for further exploration into the potential of team personality diversity within student teams, with an emphasis on longitudinal studies to capture the temporal dynamics of collaborative interactions. This study contributes to the growing body of literature on team dynamics in educational settings, offering valuable insights for educators and practitioners seeking to optimize student experiences, enhance group learning outcomes, and prepare students for their future careers.

Keywords: Group-level Approach, Team Personality Diversity, Team Processes, Team Effectiveness

1. Introduction

Group work has been increasingly integrated into educational landscapes, as it enables students to develop their soft skills and engage with plural viewpoints and perspectives (Urionabarrenetxea et al, 2021). By working in teams, students improve their ability to foster effective communication within the group and learn to support and assist the progress of their peers (Baviera et al, 2022).

One critical factor influencing team effectiveness lies in the personality of its members. Specifically, since the 1990s, research has growingly emphasized that personality influences teams through the mixture it causes within them (Moynihan and Peterson, 2001). This blend is often operationalized to reflect team personality diversity, corresponding to the variability of individual personality attributes, and becomes more important as teams collaborate over time (Harrison et al, 2002). Moreover, it is one of the most common methods for aggregating individual personality scores and describing team personality composition (Prewett et al, 2009).

Despite the assertion that team personality composition is more predictive of team behaviors, functioning, and processes than of its outcomes (Prewett et al, 2009), studies investigating the relationship between team personality and team effectiveness rarely adopt an input-process-outcome model (LePine et al, 2011). However, addressing the intervention of processes such as communication and conflict is crucial for achieving a comprehensive understanding of the association between forms of team personality diversity and team effectiveness (Triana et al, 2021). Therefore, to better understand how team personality diversity influences team effectiveness, our goals are to: (i) test the effects of the factors that comprise the Five-Factor Model of personality (McCrae and Costa, 2008) on team effectiveness, (ii) describe the effects carried by these factors on

different measures of effectiveness, and (iii) gauge the role of team processes and emergent states in this relationship.

2. Literature Review

2.1 Team Effectiveness

Team effectiveness refers to the final stage of research on group dynamics (Hackman, 1987). Although various approaches measure team effectiveness, it typically encompasses two types of criteria, be it internal and external, or proximal and distal (Kozlowski and Bell 2003). Among all the definitions, the one proposed by Hackman (1987) stands out as the most prominent.

Under this definition, team satisfaction and viability are internal criteria, whereas task performance is an external criterion. In educational contexts, external criteria assess student teams' knowledge and learning, reflecting teachers' or institutions' perspectives, while internal criteria arise from students' perceptions (Urionabarrenetxea et al, 2021).

Task performance of student groups is commonly measured through assignment grades, indicating whether the set standards are met or exceeded (Hackman, 1987). Whereas team satisfaction is widely studied in education and includes satisfaction with the team and with the project, team viability acquires more relevance in long-term teams (Bell and Marentette, 2011). In effect, authors should prioritize perceived learning when researching the effectiveness of student teams, as it represents an expected outcome in this context (Urionabarrenetxea et al, 2021).

2.2 Team Personality Diversity

Team personality diversity calculations are based on fundamental personality traits that form the core of a universal system, shaping patterns of thoughts, feelings, and actions (McCrae and Costa, 2008). These individual characteristics exert an influence on how team members contribute to tasks and interact with one another during group work (Molleman et al, 2004; Prewett et al, 2009). Traits are organized hierarchically from narrow and specific to broad and general dispositions, with extraversion, agreeableness, conscientiousness, openness to experience, and neuroticism at the top (McCrae and Costa, 2008). Neuroticism is often reversed to indicate emotional stability (Moynihan and Peterson, 2001).

According to McCrae and John (1992), people who score high on extraversion tend to be warm, cheerful, and ambitious, while those scoring lower may be quiet or shy. Agreeableness involves characteristics such as altruism, nurturance, and emotional support at one end, and self-centeredness and jealousy at the other. Conscientiousness combines prudence with the willingness to achieve, so that conscientious individuals are often characterized by thoroughness, organization, and goal-oriented behavior, whereas those low in conscientiousness may lack self-discipline. Emotional stability reflects the propensity to experience distress, with high scorers being relaxed and even-tempered, while low scorers are prone to negative emotions. Openness to experience involves imagination and intellectual interests, contrasting with conservative values at the lower end. Students frequently underscore the significance of these dispositions, observing that effective teams are those whose members coordinate different types of people and adeptly manage individual character traits (e.g.: Baviera et al, 2022).

Group personality composition is regarded as a resource available to teams because it reflects the attributes of its members (Kozlowski and Bell, 2003). Personality traits, as deep-level attributes, are rooted in psychological characteristics not readily observable (Harrison and Klein 2007; Triana et al, 2021). Authors such as Triana et al (2021) underline that the theoretical underpinnings of the research on deep-level diversity are the ones described by Williams and O'Reilly (1998). On the one hand, social categorization and similarity/attraction theories highlight the risks of high diversity levels, such as increased cognitive biases and communication challenges. On the other hand, the information and decision-making perspective suggests diversity augments the information available for problem-solving and enhances creativity (Williams and O'Reilly, 1998).

Although these three theories are prominent in the literature focused on the consequences of diversity in personality characteristics, Prewett et al (2009) and LePine et al (2011) suggested that, depending on the trait, team personality diversity can both promote and hinder team effectiveness. For instance, expanding on this trait-oriented perspective, Humphrey et al (2007) argued that diversity in extraversion can benefit teams by

enabling role differentiation, while higher levels of diversity in conscientiousness might jeopardize teamwork due to diverging goals.

H1: Team personality diversity is directly related to team effectiveness.

2.3 Processes and Emergent States

Kozlowski and Bell (2003) understand compositional variables as factors with a powerful influence on team processes and outcomes. Instead of moderating the link between group composition and effectiveness, team processes are likely caused by team personality or demographic composition, particularly in student teams with fewer external constraints (Kozlowski and Bell 2003).

In alignment with this perspective, personality diversity, as a form of personality composition, may hold a more pronounced influence on processes associated with the quality of team functioning than on team effectiveness variables (Prewett et al, 2009; LePine et al, 2011). Ilgen et al (2005) describe these processes as twofold: i) behavioral processes, including task-focus, communication, and conflict, are cognitive, verbal, and behavioral activities aimed at achieving goals through interdependent interactions among team members (Marks et al, 2001); ii) team emergent states, like cohesion, capture motivational tendencies, relationships between members of the same group and affective reactions rather than describing how individuals interact (Marks et al, 2001). Consequently, personality diversity shapes a broad range of social and task-related processes, influencing task execution, attachment to the team, and task commitment.

H2: Team personality diversity directly impacts team processes and emergent states.

Beyond capturing interpersonal dynamics fundamental to group work, team processes and emergent states indicate how a group collectively advances toward task completion (Hackman, 1987) and serve as mechanisms through which teams combine resources and capabilities (Ilgen et al, 2005; Kozlowski and Bell 2003; Marks et al, 2001), playing a pivotal role as drivers of team effectiveness. Furthermore, research also suggests that team personality diversity affects team effectiveness through social integration, group processes quality, and states formed during group interactions (Guillaume et al, 2012; Triana et al, 2021).

H3: Team processes and emergent states directly influence team effectiveness.

H4: Team processes and emergent states mediate the impact of team personality diversity on team effectiveness.

3. Methodology

We employed a quantitative approach, implementing a two-wave study to mitigate method bias. Consistent with procedures followed by Mohammed and Angell (2003), personality measures were collected in the first half of the semester, and data on team functioning and effectiveness were gathered two months later.

3.1 Sample and Procedure

To focus on groups with strong performance incentives, we targeted students enrolled in courses where at least 30% of the final grade depended on a group assignment. To be included, participants needed to respond fully to both waves of data collection. Additionally, understanding diversity as a distribution of differences (Harrison and Klein, 2007), only teams in which at least three and more than half of the members provided completed data were accepted. Finally, the groups included were the ones whose members showed a high level of agreement when evaluating group constructs.

Altogether, the final sample consisted of 57 teams of 221 undergraduate and graduate students from a Portuguese Business School, averaging 3.88 complete answers and 4.66 members per group.

3.2 Measures and Operationalization

Table 1 summarizes the study dimensions and measurements. Group scores were aggregated from individual scores.

Personality was assessed using the 50-item set of Big-Five factor markers (Goldberg et al, 2006). Acknowledging differences in personality as part of the separation type of diversity (Harrison and Klein, 2007), we used standard deviation to quantify within-group diversity of personality characteristics, while team effectiveness was

measured through group assignment grades, team satisfaction, and perceived learning. To control for the potential influence of the specific context of each curricular unit on the final grades of the assignments, these were normalized by course.

Table 1: Variables included in the study.

Variables	Dimensions	Scale	Group Score
Personality	Extraversion Agreeableness Conscientiousness Emotional Stability Openness to Experience	Goldberg et al (2006)	Standard Deviation
Processes And Emergent States	Task-focus	Barry and Stewart (1997)	Arithmetical Average
	Communication Openness	O'Reilly and Roberts (1977)	
	Cohesion	Barrick et al (2007)	
	Task-conflict	Jehn (1995)	
Team Effectiveness	Team Satisfaction	Peeters et al (2006)	Arithmetical Average
	Perceived Learning	Bravo et al (2019)	
	Group Assignment Grade	Not applicable	Normalization of course grades

4. Results

4.1 Preliminary Analyses

When aggregating team constructs by mean, we required consensus among members of the same team. To validate the aggregation, it was necessary to verify whether average scores exhibited acceptable levels of reliability and agreement (Van Mierlo et al, 2009). Therefore, intraclass correlation coefficients (ICC) were calculated to assess reliability, while rWG(J) was used as a measure of within-group agreement (Bliese, 2000).

In this context, evaluations of team perceived learning were not sufficiently influenced by working in a group (ICC(1) = 0.155), nor did they derive reliable group means (ICC(2) = 0.416). Thus, this construct was removed from further analyses. All other constructs (i.e., task-focus, communication openness, cohesion, task-conflict, and team satisfaction) yielded ICC(1), ICC(2) and rWG(J) values of over 0.2, 0.6 and 0.9, respectively, supporting their aggregation to the group level. Table 2 presents a summary of the results related to the measures of reliability and agreement.

Table 2: Validation of the aggregation to the group level

Construct	ICC(1)	ICC(2)	rWG(J)
Task-focus	0.297	0.621	0.9242
Communication Openness	0.378	0.702	0.8957
Cohesion	0.486	0.786	0.9518
Task-conflict	0.295	0.619	0.9344
Perceived Learning	0.155	0.416	0.9685
Team Satisfaction	0.431	0.756	0.9011

Concerning personality variables, a principal component analysis (PCA) was conducted on individual data in order to identify the traits underlying the five-factor structure of personality (McCrae and Costa, 2008). After eliminating items with communalities below 0.47, the final solution only kept 3 of the 10 items used to measure conscientiousness and openness to experience, and 2 of the items intended to measure agreeableness. Since Saucier and Goldberg (2002) suggested a minimum of 4 items to define personality dimensions, agreeableness, conscientiousness, and openness to experience were excluded from the final model of the study.

4.2 Path Analysis

The results of the preliminary analyses, coupled with the hypotheses outlined in Chapter 2, led to the creation of the path diagram depicted in Figure 1. To enhance readability, only significant coefficients, denoted by solid lines, are presented. Conversely, relationships lacking statistical significance are represented by dashed lines. The variables were standardized prior to the analysis, and all effects were estimated through the bootstrapping technique.

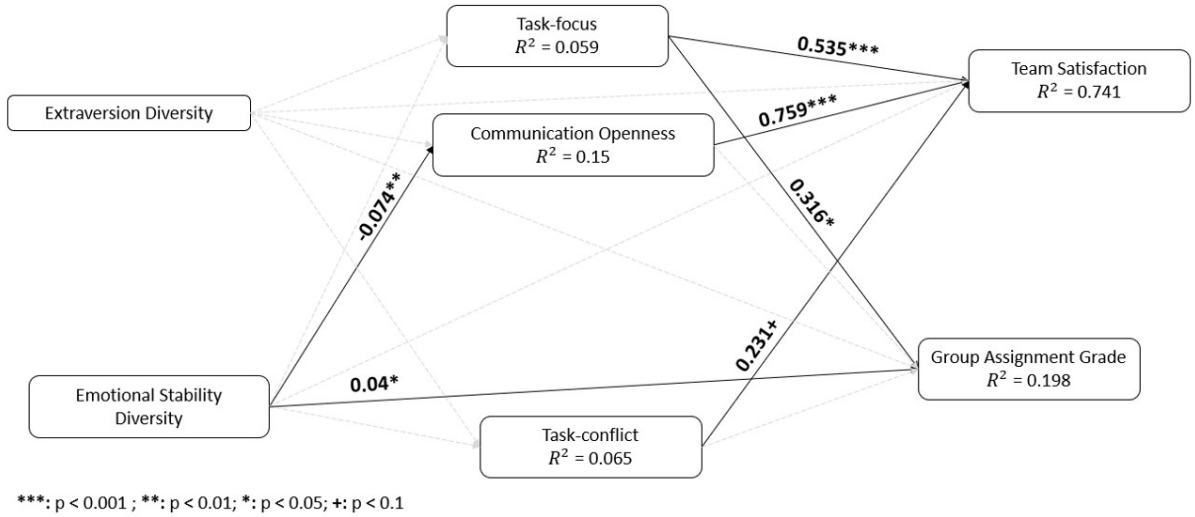

Figure 1: Path Diagram

Starting from the direct effects of personality diversity, only emotional stability influenced team processes and team effectiveness factors. Despite being significant (β = 0.04; p = 0.0423), the 95 percent confidence interval for the effect of emotional stability diversity on the grades obtained by teams includes 0 (95% CI =]-0.003; 0.077[), which does not preclude the possibility that the real effect is null.

Conversely, emotional stability significantly reduced communication openness within groups (β = -0.074; p = 0.009), while communication openness (β = 0.759; p < 0.001) and task-conflict (β = 0.231; p = 0.092) promoted team satisfaction, albeit the latter only marginally. Notably, task-focus significantly influenced both team satisfaction (β = 0.535; p < 0,001) and group grades (β = 0.316; p = 0.023). Despite this, H2 and H3 received limited or partial support.

As for H4, our results suggest that emotional stability diversity indirectly reduces team satisfaction through its negative impact on communication openness (β = -0.056; p = 0.011). This indirect effect arises from the decrease caused by emotional stability diversity in communication openness, coupled with the subsequent increase in team satisfaction resulting from enhanced communication openness. The 95 percent confidence interval for the indirect effect reinforces this conclusion, as it does not include 0 (95 % CI =]-0.102; -0.014[), and the result remains consistent even after correcting for eventual asymmetries on the bootstrap distribution (95% CI =]-0.116; -0.022[).

5. Discussion

In light of the growing recognition of group work as a means of fostering soft skills among students (Baviera et al, 2022; Urionabarrenetxea et al, 2021), with some universities already implementing tailored programs to enhance students' ability to confidently face the challenges associated with it (Baviera et al, 2022), we intended to investigate the degree to which personality diversity impacts team effectiveness. Acknowledging that personality features may exert a stronger influence on behavioral variables that drive group functioning (Prewett et al, 2009), known as team processes, we posited that team personality diversity would relate to team effectiveness through these variables. This is consistent with the leading models in the field of group work (Ilgen et al, 2005; Kozlowski and Bell 2003). Likewise, as we aimed to establish relationships between compositional factors and team effectiveness criteria, statistical procedures were adopted to measure all the constructs at the team level (Prewett et al, 2009).

The indirect effect of emotional stability diversity on team satisfaction aligns with the predicted outcomes of social categorization and similarity/attraction theories (Triana et al, 2021). In effect, the findings of Gerlach and Gockel (2022) can help explain the decrease in communication openness caused by emotional stability diversity. According to these authors, members within teams diverse in emotional stability may feel discomfort due to perceived differences in communication styles, which likely reduces the propensity of team elements to seek and engage in helping behaviors. In turn, the positive effect of communication openness on team satisfaction may have occurred because open communication enables teams to orchestrate their work and perform effectively (Barrick et al, 2007). Molleman et al (2004) further suggest that diversity in emotional stability creates structural differences in working methods within teams, with members who score higher on this trait feeling confident when facing ambiguous tasks, while low scorers tend to feel insecure.

However, most of the tested relationships were not statistically significant. This lack of results might be related to the circumstances under which personality plays a more meaningful role. Following this line of reasoning, Prewett et al (2009) propose that all forms of personality composition acquire more relevance in tasks requiring high levels of interaction and coordination from teams entrusted with them. Task interdependence thus increases opportunities for team members to interact, either making differences in deep-level attributes more salient (Guillaume et al, 2012) or amplifying the complexity of coordinating those interactions (LePine et al, 2008). As a moderator of the potential relationships between personality diversity and team processes and between team processes and team effectiveness, task interdependence may not have reached sufficient magnitude in this study.

Furthermore, student teams usually work for short periods of time, thereby having lower temporal stability (Hollenbeck et al, 2012). Seeking benefits such as efficiency in responding to assignments (Sjølie et al, 2022), they are tempted to allocate tasks individually, with each member performing their assigned task independently. Moreover, as they work for brief spans, student teams may not always feel the necessity to engage in extensive discussions or exchanges of ideas, which could potentially result in a weakening of the connection between the quality of their functioning and the outcomes they achieve.

Despite these limitations, the indirect effect of emotional stability diversity on team satisfaction, an internal criterion of team effectiveness, is in line with the proposition made by LePine et al (2011) regarding the transmission of effects from personality composition to team effectiveness. In addition, the direction of the effect is consistent with predictions under similarity/attraction and social categorization theories (Guillaume et al, 2012; Harrison and Klein 2007) and with recommendations for low levels of diversity in emotional stability (Moynihan and Peterson 2001).

6. Limitations and Future Research

The methodology employed in this study, wherein every student was required to fully respond to the relevant items of both questionnaires, resulted in a meaningful portion of the initial sample not being retained. This limitation is considerable, as it precluded the retention of the complete composition of certain teams. Additionally, the duration of the disciplines in which some students were enrolled, as well as the projects assigned to them, was short. This circumstance may have hindered the emergence of personality diversity because deep-level attributes typically become more salient throughout the course of team collaboration (Harrison et al, 2002).

In addition to the brevity of the group assignments, many were comprised of a singular assessment stage. It would be valuable to examine the proposed relationships in a longitudinal study involving teams with multiple assessments and demanding deadlines, such as student project teams (Peeters et al, 2006). The presence of multiple assessments can prompt team members to address biases or reinforce the advantages of diverse personalities, as outcomes from one task can serve as inputs to the following (Ilgen et al, 2005). This setting allows teams to refine their processes between tasks, adjusting them to the compositional characteristics they possess, and, conceivably, fosters collaboration skills in students.

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