

# Did Curiosity Spark Creativity?

## Examining the Mediating and Moderating Processes In the Curiosity-Creativity Relationship

Xin Lian, Baiyin Yang, Zhenxiong Chen and Serene Ng

Department of Human Resource Management

School of Economics and Management, Tsinghua University, Beijing, China

### Abstract

Although it intuitively makes sense that employees' curiosity can lead to individual creativity, no systematic study has been conducted to investigate such relationship in workplace. Using a sample of 599 supervisor-subordinate dyads from a company in China, we examine the mediating and moderating process in the curiosity-creativity relationship. Our study finds that (1) curiosity is positively related to employee's creativity, (2) intrinsic motivation fully mediates the relationship between curiosity and creativity, and (3) both performance goal orientation and learning goal orientation moderate the curiosity-intrinsic motivation relationship. We discuss the implications of these results for research and practice.

**Keywords:** creativity, curiosity, intrinsic motivation, goal orientation

### Introduction

In today's turbulent times, heightened competition, and unpredictable technological change, enhancing employee's creativity has become an imperative step for organizational survival (Amabile, 1988; Devanna & Tichy, 1990; Kanter, 1983; Shalley, 1995; Zhou & George, 2003; Simmons & Ren, 2009). Creativity refers to the generation of new and useful ideas concerning products, services, processes and procedures in organizations (Amabile, Conti, Coon, Lazenby, & Herron, 1996; Scott & Bruce, 1994; Woodman, Sawyer, & Griffin, 1993; Zhou & Shalley, 2003). In the quest to identify antecedents for employee's creativity, researchers have turned to identify specific personal characteristics and attributes that are associated with creative achievements (Barron & Harrington, 1981; Davis, 1989; Martindale, 1989; Oldham & Cummings, 1996; George & Zhou, 2001). Some researchers studied the impacts of individual personalities on creativity such as proactiveness (Oldham & Cummings, 1996), others investigated that both openness to experience and conscientiousness predict employee's creativity (George & Zhou, 2001).

Although a number of studies have demonstrated that a stable set of personal characteristics that includes broad interests, attraction to complexity, intuition, aesthetic sensitivity, toleration of ambiguity, self-confidence, openness to experience and conscientiousness are related to measures of creative performance across a variety of domains (Barron & Harrington, 1981; Gough, 1979; Martindale, 1989; Oldham & Cummings, 1996; George & Zhou, 2001), a missing link in this valuable stream of research is the role of curiosity (Csikszentmihalyi, 1996; Kashdan & Fincham, 2002). Curiosity has been recognized as a critical driver of positive outcomes such as scientific discoveries (e.g. Simon 1992), creative arts and literature (Kreitler & Kreitler, 1972) and negative consequences such as drug, alcohol and sexual abuse (Lowenstein, 1994). Specifically regarding the creative

literature, empirical studies have demonstrated that curiosity is positively related to a child's creativity in the education field (Maw & Maw, 1970; Kashdan et al., 2004). However, no systematic study has been conducted to investigate curiosity-creativity relationship in workplace. In this study, we consider curiosity as a trait and define it as the "desire to know" and such a desire energizes individual exploration (Berlyne, 1966; Litman, 2005; Loewenstein, 1994; Spencer & David, 2011). Building on research relating to curiosity and creativity, we seek to contribute the existing creativity literature by exploring how curiosity influences one's creativity in the workplace.

Apart from examining the direct relationship between curiosity and creativity, we draw from intrinsic motivation theory to explain the mediating role of intrinsic motivation that links one's curiosity to creativity. Intrinsic motivation refers to the motivational state in which employees are interested in and stimulated by the work task itself (Deci & Ryan, 1985; Shin & Zhou, 2003). Despite the preponderance in the creativity literature that has relied on intrinsic motivation theory (Amabile, 1996; Oldham & Cummings, 1996), few studies have tested the mediating role of intrinsic motivation between personality and creativity. As such, we seek to explicate the underlying processes that intrinsic motivation plays in the curiosity-creativity relationship. In addition, our study aims to identify possible evidences of discriminant validity between these two closely related constructs.

Researchers in employee creativity have suggested that goal orientations may motivate individuals to seek out or avoid opportunities for creativity and learning (Edmondson, 1999; Hirst, Knippenberg & Zhou, 2009). We seek to validate the role that one's goal orientation plays in the relationship between curiosity and creativity. We propose that the extent to which an employee is intrinsically motivated to seek out and explore depends on the employee's goal orientation. Thus, we seek to contribute to the literature on creativity by examining two potentially important moderators: learning goal orientation and performance goal orientation. Specifically, we reason that learning goal orientation has an enhancing effect on the positive relationship between curiosity-intrinsic motivation. However, this positive relationship between curiosity and intrinsic motivation does not hold for individuals with performance goal orientation. In fact, we suggest that even when individuals are curious, high performance goal oriented individuals tend to avoid engaging in creative work that carries greater risks of failure (Hirst et al. 2011).

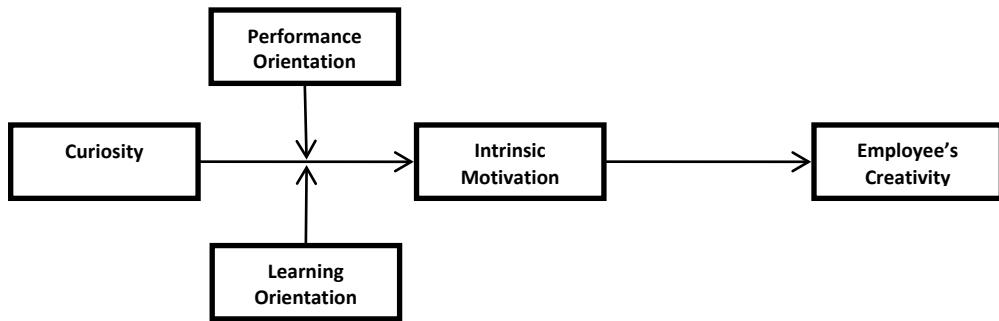
In summary, we seek to contribute to the literature on creativity by identifying a specific personality trait-curiosity as the antecedent to creativity. Second, by drawing from the intrinsic motivation theory, we explicate the psychological mechanism linking curiosity-creativity relationship by positing intrinsic motivation as the mediator. Finally, we build a theory by positing and testing that the moderating influences of employee's goal orientations (learning orientation and performance orientation).

## Theoretical Framework And Hypotheses

The stream of empirical studies that examine the relationship between personality traits and creativity has been well documented (George & Zhou, 2001; Oldham & Cummings, 1996). For example, George and Zhou (2001) found that both openness to experience and conscientiousness predict employee's creativity. This focus on examining the relationship between personality and creativity is motivated by demands within the creativity literature to predict the types of creative people. However, in examining the types of individual differences that predict creativity, "even the researchers who have developed the most comprehensive measures . . . have recognized the need for more specific levels of measurement" (Schmit & Ryan, 1993, p. 972). In particular, Amabile (1996) urged

researchers to explore “narrow traits” that are theoretically relevant by using narrow traits, one can better distinguish and predict more reliably the extent of creativity (Fesit, 1998). The curiosity trait enables individual to link “cues reflecting novelty”—which are essential and relevant to creativity (Csikszentmihalyi, 1996). Weick (1993) also asserted that curiosity is critical for “changing times”. Hence, based on previous theory and research, we suggest that curiosity is a personality trait that may be most relevant to understand creativity (Kashdan et al., 2004; Davis, 2004; Barell, 2002; Langevin, 1971). Figure 1 summarizes the hypothesized model we test in this study.

**Figure 1 Curiosity and Employee’s Creativity**



### Curiosity and Creativity

Consistent with previous research, we define curiosity as the “desire to know” that energizes individual exploration (Berlyne, 1966; Litman, 2005; Loewenstein, 1994). Curiosity, like other trait constructs, has a trait/state dynamic: individuals with a curiosity trait are likely to experience more frequent and more intense state of curiosity (Boyle, 1989; Kashdan et al., 2004; Spielberger & Starr, 1994). As such, these curiosity traits enable individuals to link “cues reflecting novelty” (Louis, 1980) which constitutes the core of creative personality (Davis, 2004). Osborn quoted James Harvey Robinson in his foundational work *Applied Imagination* (1963), “even occasionally and fitfully idle curiosity leads to creative thought”(p. 308), and Berlyne (1960) posited that curiosity is a precursor to creativity. Csikszentmihalyi (1996) also recognizes the critical role curiosity plays in creativity and clearly stresses that “the first step toward a more creative life is the cultivation of curiosity” (p. 346). Furthermore, in Creative Change Model adaptation of the four Ps model of creativity (creative process, people, press, product) (Puccio, Murdock, & Mance, 2007), curiosity is at the heart of creativity. Employees with high curiosity are more willing to take risks. While people are uncomfortable with an uncertain or ambiguous situation, curious employees will more likely view it as an opportunity for exploration (Barell, 2002). That is, they will both challenge themselves and are open to new alternatives. Additionally, there are empirical studies that state and verify that kid’s curiosity is positively related to creativity in the education field (Maw & Maw, 1970; Kashdan et al., 2004). Therefore, we predict the following:

*Hypothesis 1: Curiosity is positively related to employee’s creativity.*

## **Curiosity and Intrinsic Motivation**

We draw from the cognitive dissonance theory to explain the relationship between curiosity and intrinsic motivation. An individual experiences cognitive dissonance when he or she holds conflicting cognitions (e.g., ideas, beliefs, values, emotional reactions) simultaneously (Festinger, 1957). The theory of cognitive dissonance proposes that people hold the cognitive needs to reduce dissonance by altering existing cognitions, adding new ones to create a consistent belief system, or alternatively by reducing the importance of any one of the dissonant elements (Spencer, 2006). The need for cognition is considered as “a need to structure relevant situations in meaningful, integrated ways” (Cohen, Stotland & Wolfe, 1955), which is the driving force and source of the individual’s activities (Herzberg, 1959). The need for cognition, once generated, becomes a stimulus that drives people to take actions to eliminate such physiological and psychological imbalance (Maslow, 1970). At this point, the intrinsic physiological need serves as a direct driving force of the person’s food-seeking behavior. Therefore, the motivation is generated on the basis of need to restore any imbalances (Herzberg, 1959; Maslow, 1970). More specifically, we argue that the need to reduce cognitive dissonance generates an intrinsic motivation to seek out and explore alternatives.

Drawing from the cognitive dissonance theory, cognitive dissonance will engender the behavioral motivation to pursue and maintain that balance (Festinger, 1957; Maslow, 1970). Cognitive dissonance occurs when there is inconsistency, complexity, uncertainty and conflict of novel stimulus, as well as incongruity from the original internal mode (Berlyne, 1955, 1966). Accordingly, when an individual’s internal cognitive need is not balanced, there is a motivational drive for the individual to seek and explore further in order to reach a new cognitive balance. Deci (1985) states that if the needs to pursue cognitive balance is positively reinforced, one’s confidence and satisfaction with the needs get stronger, thus strengthening one’s intrinsic motivation.

Piaget (1969) viewed curiosity as the product of cognitive disequilibrium evoked by individual attempt to assimilate new information into existing cognitive structures. There are two contrasting facets of curiosity as a trait: 1) openness to novel stimuli and 2) a concern for orderliness (David, 2009). People who readily accept and seek out novel, strange or unusual things, who are in general stimulus seeking, are typically not concerned with having everything in its proper place or with orderliness in general. Vice versa, people who value orderliness may not as often seek novel or strange things. Highly curious people tend to have both of these contrasting characteristics; that is, they seek both novelty and orderliness. If they have either one alone, that is, if they seek novelty without caring for orderliness, or they disregard novel stimuli while guarding their structured map of the world, they will tend to experience fewer conceptual conflicts. On the other hand, if they are open to novelty while seeking orderliness, they may experience conflict arising from inconsistencies and incompleteness. The characteristics of combining openness with orderliness is typical of someone with trait curiosity, and helps explain how curious people deal with conceptual conflicts and gaps in knowledge that arise from 1) a lack of fit between an incoming signal or stimulus and 2) a cognitive map or category system which represents the world from past experience (David, 2005). In a relatively orderly context, people of low curiosity tend to view the current situation as well-organized; On the other hand, highly curious individuals may perceive the current situation as ambiguous and vague. They are motivated to pay more cognitive effort to properly understand this situation and rationalize their own understanding in order to understand the situation better.

There are two ways that a highly curious person may pursue in order to resolve conceptual conflicts – 1) assimilation and 2) accommodation (David, 2000). For assimilation, the conceptual conflict is resolved by changing one's perception of what is out there, that is, by modifying the signal to fit the cognitive map. Alternatively, one can modify the cognitive map to accommodate the signal (David, 2000). Since highly curious individuals view their context as strange, unusual or unexpected, they may adopt either or both accommodation or assimilation strategies to resolve ambiguities. Assimilation drives one to pay more attention and to be involved in the task to deal with inconsistency, complexity and uncertainty that conflicts with one's original cognition mode. Accommodation motivates one to view the situation in a different way and regain satisfaction from the changed situational context. As such, individuals that are high in curiosity tend to view their situation as inconsistent, complex and uncertain (conceptual conflicts and knowledge gaps) and they tend to adopt either one or both strategies to restore a new balance to the stimulus and cognitive map. In the process of assimilating and/or accommodating, employees pay more attention to work and take on these challenges, which in turn, strengthens their task intrinsic motivation.

Berlyne's (1966; Litman, 2005) further differentiates curiosity into two main typology: 1) specific curiosity associated with narrow and often direct forms of exploration; and 2) diverse curiosity associated with broader and often more indirect forms of exploration. Diverse curiosity appears to be activated when individuals recognize opportunities to discover something that is completely new, whereas specific curiosity is stimulated when people lack a specific piece of information that can be incorporated into an existing knowledge-set or used to solve a complex problem (Litman, et al., 2005).

Individuals that are high in diverse curiosity tend to focus on the intrinsic enjoyment of new discoveries and the fun of learning new ideas in their attempt to close up the cognitive conflict between reality and expectation (Litman, 2008, 2010). When diverse curiosity is activated, learning new information is expected to result in subjectively rewarding experiences of increased interest and subsequent engagement. For employees, such emerging interest and engagement allows the individuals to devote himself or herself to the task itself in order to satisfy the cognitive needs of balance. Thus, diverse curiosity is closely related to one's intrinsic motivation to obtain new knowledge (Ryan & Deci, 2000) and has been empirically linked to intrinsic motivation in a study conducted by Litman (2010).

On the other hand, individuals that are high in specific curiosity tend to experience novelty as a problem to be solved or a mistake to be corrected (Crowe & Higgins, 1997) and actively seek new information to close the knowledge gaps (Loewenstein, 1994). Specific curiosity is concerned with the reduction of undesirable states of uncertainty. When specific curiosity is activated, acquiring new information is rewarding only if it successfully reduces uncertainty and facilitates understanding. Therefore, the reward-value of new information is determined by the information's potential to resolve a specific unknown rather than its ability to stimulate situational interest. Consequently, the correctness and relevance of newly acquired knowledge is critical to the satisfaction of specific curiosity. For these reasons, specific curiosity is theorized to play a greater role in setting performance-oriented learning goals, for which achievement is determined on the basis of objective and demonstrable criteria (Elliot & Church, 1997; Litman, 2008). Thus, specific curiosity is theorized to be a more "integrated" motive that involves both the intrinsic pleasure of learning and extrinsically regulated concerns about the accuracy or fit of newly gathered information (Litman, 2008; Ryan & Deci, 2000). In empirical study by Litman (2010), he concluded that specific curiosity is correlated positively with both intrinsic and extrinsic motivation. Based on the above theoretical arguments and empirical evidences, we predict the following:

*Hypothesis 2: Curiosity is positively related to intrinsic motivation.*

## **Intrinsic Motivation and Creativity**

Past empirical studies have examined and linked intrinsic motivation with individual creativity. Intrinsic motivation is one of the most critical elements in predicting employee's creativity (Amabile, 1997; Ford, 1996; Woodman, Sawyer & Griffin, 1993a). When an individual is fascinated by the tasks/job, he or she tends to be more passionate and demonstrates the willingness to dedicate effort and energy to solve problems and generate new ideas thereby enhancing one's creativity (Amabile, 1996). Apart from studies in the West, findings of empirical research in Korea also demonstrate the positive relationship between intrinsic motivation and creativity (Shin & Zhou, 2003). Accordingly, we hypothesize a direct relationship of intrinsic motivation on employee's creativity:

*Hypothesis 3: Intrinsic motivation is positively related to employee's creativity.*

## **Intrinsic Motivation as Mediator between Curiosity and Creativity**

Feist (1998) reports that personality trait is an important determinant of intrinsic motivation and creativity at work. Prabhu, Sutton and Sauser (2008) provided empirical results showing that intrinsic motivation acts as a mediator through which personality traits influence creativity. Amabile (1983) pointed out that individuals may have certain traits and abilities that are favorable for creativity, but whether these will actually result in achieving creative results depends on their intrinsic motivation. The role of intrinsic motivation as a conduit that facilitates creativity is similarly implied in Runco's (2004) model of individual's creativity and Ambrose's (1999) motivation literature. Prabhu et al. (2008) emphasize the importance of intrinsic motivation as mediator of the relationship between creativity and three personality traits: openness of experience, self-efficacy, and perseverance. Steiner (1965) argued that in order to be creative, an individual has to be inherently interested in the issue or problem and motivated to find a solution. Intrinsically motivated individuals are engaged in for their own sake and for the pleasure and satisfaction derived from the process of engaging in the particular activity (Deci & Ryan, 1985). Intrinsically motivated behaviors are associated with psychological wellbeing, interest, enjoyment, fun, and persistence (Ryan & Deci, 2000).

Specific curiosity drives individuals to explore and investigate gaps in knowledge through intrinsic motivation, thereby refining and extending the knowledge needed to fulfill their jobs in new ways that better fit expectations. Diverse curiosity challenges individuals to modify their original thinking and view the tasks in new perspective, driving individuals to develop novel approaches to focus and energize the tasks and hence facilitating not only increased intrinsic motivation but also new ideas or means to deal with the tasks and practicing in them. Therefore, we predict the following:

*Hypothesis 4: Intrinsic motivation will mediate the relationship between curiosity and employee's creativity.*

## **Goal Orientations as Moderators of Curiosity and Intrinsic Motivation**

Goal theorists maintain that an individual's goal orientation creates a framework for him or her to approach, experience, and respond to achievement situations (e.g., Barron & Harackiewicz, 2000; Duda, 2001; Dweck, 1986, 1999; Nicholls, 1984; Pintrich, 2000). Goal orientation reflects both self-development beliefs and how these beliefs lead individuals to interpret and engage with their environment (Hirst, Knippenberg & Zhou, 2009). Within the goal literature, two types of goal orientations have generally been identified: (a) a performance goal orientation and (b) a learning goal orientation. Learning goal orientation focuses on increasing one's competence by developing new skills while performance goal orientation focuses on demonstrating one's competence by meeting normative-based

standards (Colquitt & Simmering, 1998). Button and his colleagues (1996) argue that individuals have dispositional goal orientations that predispose them to react to situation in different ways.

Previous goal theories deal with the question of how individuals approach, experience, and respond to achievement situations and suggest that differences among individuals in this regard are especially prominent when individuals are confronted with difficulty (Yperen & Janssen, 2002). Elliott and Dweck (1988) note that, when performance goal orientations are highlighted, individuals avoid difficult tasks in favor of moderate ones (when perceived ability is high) or easy ones (when perceived ability is low). Performance-oriented individuals traditionally seek to maximize rewards and minimize potential punishments, using environmental cues to decide which behaviors are appropriate (Hirst, Knippenberg & Zhou, 2009). Indeed, Fisher and Ford (in press) showed a negative link between performance goal orientation and off-task attention and Hirst et al (2011) state that performance orientation predispose individuals to stay clear of job challenges and problems that may invite acts of creativity. These results suggest that performance goal oriented individuals lack the desire to take risks and challenges because they are concerned with unpleasant aspects of the task (e.g., complexity or uncertainty) rather than pleasant ones (e.g., challenge or learning). Curiosity may be linked to a lack of control among performance-oriented individuals because they experience increasing uncertainty about their competitive standards, and they tend to believe that trying hard signifies low ability (Dweck, 1999). Furthermore, performance goal orientation disposes individuals to be less intrinsic motivated, because intrinsic motivation inherently holds challenges and the possibility of appearing incompetent discourages these individuals from engaging in risky or challenging activities (Litman, 2010) that would foster intrinsic motivation by curiosity. High performance goal oriented individuals view challenges and risks as troubles which may obstruct them to pursue higher performance. On the contrary, low performance goal oriented employees lack the drive to outperform others and they tend to evade challenges and risks rather than deal with them directly. The higher one's performance orientation, the more one should react to difficult tasks with doubts about ability levels (Elliott & Dweck, 1988). This relationship would explain the finding that highly performance-oriented individuals often avoid focusing on difficult tasks in favor of more achievable ones and curiosity usually motivates employee to pay attention to the difficult tasks. Thus, the higher the levels of performance orientation one experiences, the lower one's levels of intrinsic motivation to be creative.

On the other hand, learning goal orientation fosters an intrinsic interest in the task itself, as challenging work provides a means to develop skills and knowledge. It increases the likelihood that people invest effort and persevere to complete the complex tasks even when there is an absence of extrinsic rewards (Dweck, 1999). This is in contrast with performance-oriented individuals who tend to avoid and withdraw from challenges because trying hard may signify low ability (Yperen & Janssen, 2002). When obstacles such as inconsistency, complexity and uncertainty are encountered, learning-oriented individuals tend to deal with these circumstances by putting more effort into their jobs and by attempting to identify the strategies needed to successfully meet the demands (Dweck, 1999; Farr et al., 1993). Empirical studies show that a learning goal orientation is related to affective outcomes such as intrinsic interest, task enjoyment and satisfaction, regardless of task difficulty and the amount of effort exerted (Barron & Harackiewicz, 2000; Harackiewicz et al., 1997; Pintrich, 2000). These studies suggest that learning goal oriented individuals react to challenges with positive affect, pride and intrinsic motivation (Dweck & Leggett, 1988). In fact, the greater their learning goal orientation is, the greater effort these individuals are willing to exert. These learning goal oriented individuals view such persistence as desirable attributes of the

self and as an indication of success (Duda, 2001; Dweck, 1999). Furthermore, highly learning goal oriented individuals are more likely to seek challenges and view high performance as indicative of increased mastery (Dweck & Leggett, 1988). Indeed, such individuals may find themselves immersed in the task because of increased cognitive engagement to deal with cognition dissonance (Duda & Nicholls, 1992; Greene & Miller, 1996). We hereby predict the following:

*Hypothesis 5a: Performance goal orientation moderates the relationship between employee's curiosity and intrinsic motivation such that the relationship between curiosity and intrinsic motivation is negative and this negative relationship is stronger for employees with high performance goal orientation.*

*Hypothesis 5b: Learning goal orientation moderates the relationship between employee's curiosity and intrinsic motivation such that the positive relationship between curiosity and intrinsic motivation is stronger for employees with high learning goal orientation.*

## Method

### Participants and Procedure

We tested our hypotheses using data collected from the employees and their immediate supervisors in a research and production company from energy industry in the People's Republic of China (PRC). The survey was conducted during their working hour. The participants were instructed the objectives of the survey, procedures for completing the questionnaires, and were assured of the confidentiality of their responses. They were required to seal their completed questionnaires into provided return envelopes and return to the human resources department of the company. Then we collected the questionnaires with the sealed envelopes from that department. We used a coding scheme to ensure matched supervisor-subordinate data. The subordinates completed measurements of trait curiosity, intrinsic motivation, and goal orientations (performance and learning dimensions). On a separate questionnaire, the supervisors evaluated their subordinates' creativity. On average, each supervisor assessed the creativity for about six subordinates. We distributed questionnaires to 685 employees and 106 supervisors and received 599 pairs of completed questionnaires, giving us an overall response rate of 87 percent. The average age of the employees was 38.01 years while the average job tenure was 6.32 years. Among the 599 participants, 62.7% were male, 37.3% were female; 13.7% with master or doctoral degrees, 83.2% with bachelor degrees, 2.8% had a college education degree and 3% did not report their education level.

### Measures

All measures were administered in Chinese following Brislin's (1980) translation-back-translation procedure. In order to make consistency among scales borrowed from different sources, we used 6-point scale to measure all constructs used in the study.

**Curiosity.** Curiosity was measured using the Curiosity and Exploration Inventory (CEI; Kashdan, T. B., Rose, P., & Fincham, F. D., 2004). The CEI contains seven self-report questions that are rated on a 4-point scale. The scale includes four questions that assess exploratory components of curiosity (i.e., "Everywhere I go, I am out looking for new things to experience"), and three questions that assess absorption components of curiosity (i.e., "When I am participating in an activity, I tend to get so involved that I lose track of time"). In the current study, the reliability alpha for this scale is .79.

**Intrinsic motivation.** We averaged five items adapted from Tierney et al. (1999) to measure intrinsic motivation ( $\alpha = .84$ ). On a seven-point scale ranging from "corresponds not at all" to "corresponds exactly," employees indicated the extent to which each of the five items applied to them in terms of enjoying their current creativity-related tasks. Sample items were "I am currently engaged in my tasks (1) because I enjoy finding solutions to complex problems and (2) because I enjoy coming up with new ideas for products." The Cronbach alpha in the current study is .86.

**Goal orientation.** Individual differences in goal orientation were assessed with scales based on the Task and Ego Orientation in Sport Questionnaire (TEOSQ), developed by Duda (2001) and extended and applied to the context of work by VanYperen and Diderich (1998). We asked respondents to think of when they felt most successful in their jobs and to indicate their degree of agreement with 19 items designed to assess performance-oriented and learning-oriented criteria. Responses were provided on a five-point scale ranging from 1, "strongly disagree," to 5, "strongly agree." Mean scale scores were calculated for each of the two subscales and ranged from 1 ("low") to 5 ("high"). An example of an item is "I feel most successful in my job when ... ". Performance goal orientation was assessed with eight items; an example is ". . . I perform better than my colleagues." Learning goal orientation was assessed by 11 items; an example is ". . . I acquire new knowledge or master a new skill which was difficult for me in the past." VanYperen and Diderich (1998) subjected the 19 items to a factor analysis (principal-component method) and showed that the two sets of items split cleanly into the two hypothesized factors, explaining 52.4 percent of the total variance. In the present study, the Cronbach's alphas were .87 and .94 respectively for performance goal orientation and learning goal orientation scales.

**Employee creativity.** We used Tierney and Farmer (1999) 9-item scale to measure creativity using a 6-point scale ( $\alpha = .95$ ). Sample items are "Demonstrated originality in hider work." and "Tried out new ideas and approached to problems." Supervisors were instructed to report how often each of their employees demonstrate such behaviors. Higher scores indicated higher levels of creativity.

**Control variables.** We controlled for several demographic variables that have been found to be significantly related to creativity (e.g., George & Zhou, 2001; Shalley et al., 2004). Age was measured in years. Company tenure was measured as the number of years that an employee had been in the company. Education level (doctoral, master's, and bachelor's degrees) was controlled for because it has been associated with creativity through task domain expertise (Amabile, 1988; Mumford & Gustafson, 1988).

## Results

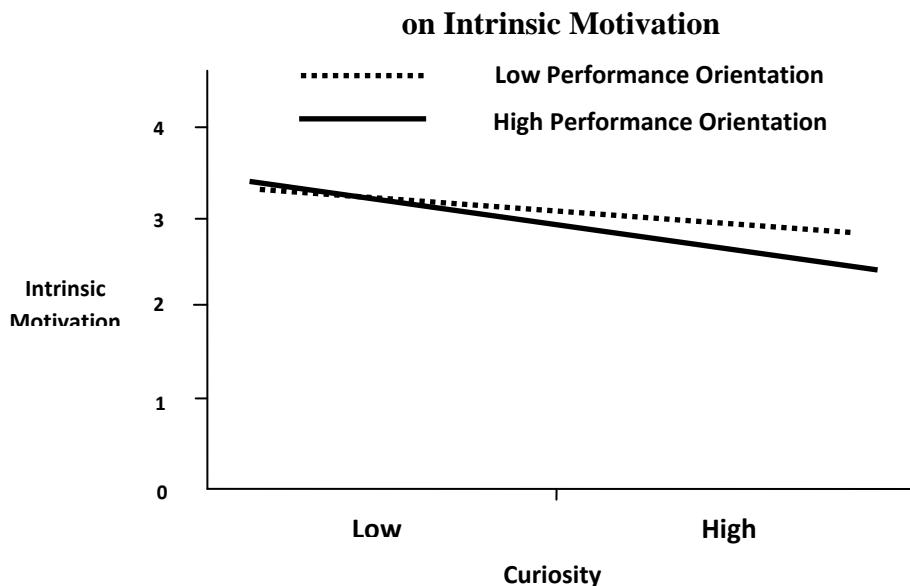
Table 1 shows the means, standard deviations, and correlations among all variables. Creativity is significantly and positively correlated with curiosity and intrinsic motivation. It is not correlated with performance goal orientation and learning goal orientation. Curiosity is significantly and positively correlated with learning goal orientation and intrinsic motivation.

To test the hypotheses, we conducted hierarchical regression analyses. Table 2 summarizes the regression results for testing Hypothesis 1 to Hypothesis 3. To test the mediation effects in Hypothesis 4, we followed the widely used procedure suggested by Baron and Kenny (1986). In model 1, we regressed curiosity on intrinsic motivation including the control variables. In model 2, we regressed curiosity and intrinsic motivation on creativity including the same control variables. The results supported Hypotheses 1-3 as follows: (1) Curiosity was positively related to creativity ( $\beta = .09$ ,  $p < .05$ ); (2) curiosity was positively related to intrinsic motivation ( $\beta = .64$ ,  $p < .01$ ) and (3) intrinsic motivation was

positively related to creativity ( $\beta = .16$ ,  $p < .01$ ). When controlling for the mediator, the regression coefficient for relationship between curiosity and creativity was no longer significant ( $\beta = -.01$ ,  $p > .05$ ) indicating that intrinsic motivation fully mediated the relationship between curiosity and employee's creativity.

Table 3 shows the results that provided support for Hypotheses 5a and 5b, both of which posit the moderating roles of performance goal orientation and learning goal orientation in the curiosity-intrinsic motivation relationship. In keeping with Hypothesis 5a, we found that performance goal orientation interacted significantly with curiosity to influence the degree of intrinsic motivation ( $\beta = -.07$ ,  $p < .05$ ). Figure 2 suggests that, although a higher level of curiosity is associated with higher levels of intrinsic motivation, the relationship between curiosity and intrinsic motivation is negative for performance goal oriented individuals. This negative relationship is stronger for those high performance goal oriented individuals than low performance goal oriented individuals. Thus, Hypothesis 5a was supported.

**Figure 2 Interactive Effects of Performance Goal Orientation and Curiosity**



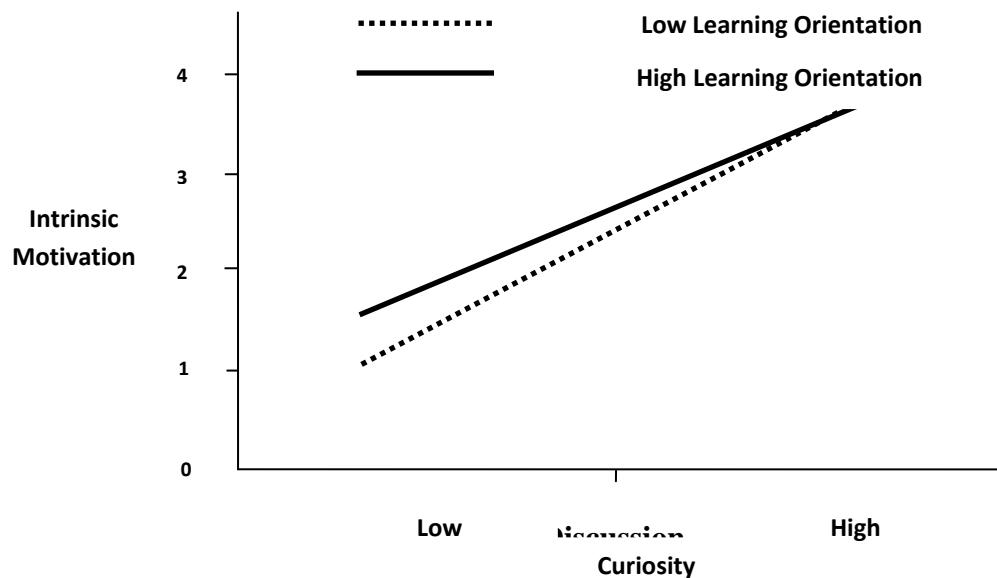
Hypothesis 5b argues that learning goal orientation moderates the relationship between curiosity and intrinsic motivation. The results supported this hypothesis ( $\beta = .06$ ,  $p < .05$ ). Figure 3 suggests that the positive relationship between curiosity and intrinsic motivation is stronger for those high learning goal orientation individuals than those with low learning goal orientation. Thus, Hypothesis 5b was supported.

## Discussion

Our study contributes to theory in the literature on employee creativity. First, we have built and tested a conceptual model that uniquely integrates theories on curiosity with creativity literature. Although curiosity has been linked to individual's creativity (Kashdan & Fincham, 2002; Maw, 1970; Kashdan et al., 2004), all of such studies were conducted in education field. This is the first study to empirically test the relationship between curiosity and individual creativity in the workplace. Notably, a number of studies have investigated relationships between personality traits (e.g., self-confident, reflective, openness to

experience and conscientiousness; self-efficacy) and employee creativity (e.g., Oldham & Cummings, 1996; George & Zhou, 2001, Prabhu, Sutton & Sauser, 2008). Curiosity has been surprisingly absent from literature on creativity. While there are strong theoretical reasons to expect curiosity to influence creative outcomes as Kashdan and Fincham (2002) assert that “We are not suggesting that high curiosity leads directly to high creativity but that high curiosity is necessary, for creativity” (p. 373), our study is the first to provide the empirical support to demonstrate the positive influence of curiosity on creativity

**Figure 3 Interactive Effects of Learning Goal Orientation and Curiosity on Intrinsic Motivation**



The second and more important contribution of our study is that it identifies the underlying psychological mechanism through which one's curiosity leads to creative outcomes. Prabhu, Sutton and Sauser (2008) emphasize the role of intrinsic motivation as mechanism through which personality traits influence creativity. However, few studies have tested this possibility in actual work settings. Amabile (1983) state that individuals may have certain traits and abilities that are favorable for creativity, but whether these will actually result in achieving creative results depends on their intrinsic motivation. This study reinforces current contemporary creativity research (e.g., Amabile, 1983, 1996; Oldham & Cummings, 1996; Shalley, 1995; Zhou, 1998; Litman et al., 2010) in theorizing that employee's intrinsic motivation is the underlying mechanism that links curiosity to employee's creativity. Thus, we contribute to the creativity literature by theorizing and empirically testing the mediating influence of intrinsic motivation in the relationship between curiosity and employee creativity.

Third, in examining the moderating roles of two goal orientations, our study contributes to the literature by providing a more nuanced understanding of the intensity of the relationship between curiosity and intrinsic motivation. We choose goal orientation for two reasons. First, our aim is to identify an individual disposition that reflects self-development beliefs and how these beliefs affect the ways individuals interpret and engage with their environment (Hirst, Knippenberg & Zhou, 2009). Second, goal orientation is a disposition (Colquitt & Simmering, 1998) that was conceptually relevant to the relationship between curiosity and employee's creativity. Scholars that have explored the relationships between goal orientations and employee's creativity have reported mixed results. Hirst, Knippenberg

and Zhou (2009) show that goal orientations are related to creativity and moderated by learning behavior while Simmons and Ren (2009) have shown that goal orientation does not directly impact on creativity but plays a moderating role between risks and creativity. Hence, this study contributes to the alternate stream of studies to show that the goal orientation is not a direct determinant of creativity, but plays a moderator role in the relationship between curiosity and intrinsic motivation. In line with the “differences when individuals are confronted with difficulty (Yperen & Janssen, 2002, p.1165).” and taking challenges and investing effort perspectives (Dweck, 1999; Barron & Harackiewicz, 2000), we find that the nature of the curiosity–employee’s intrinsic motivation relationship is different for employees with different types of goal orientations. More specifically, as shown in Figure 1 and 2, the relationship between curiosity and intrinsic motivation is positive for learning goal oriented individuals as opposed to negative relationship for performance goal oriented individuals. Whereas a high level of learning goal orientation enhances the positive relationship between curiosity and intrinsic motivation, a high level of performance goal orientation attenuates the negative relationship.

This study also has practical implications for recruiters especially those in the research and development (R&D) environment. Traditionally, recruiters have relied on high mental capability to hire professionals in the R&D and neglected a narrow or specific trait of curiosity. More importantly, this study addresses recruiters’ needs to explore beyond competencies of the candidates and understand the implications of hiring someone with strong performance orientation. Such individuals may not be able to contribute as effectively as someone who has high learning orientation in the R&D environment.

This study has several methodological strengths. First, we reduced the possibility of common method bias by collecting data from two sources: employees and their supervisors. Second, given the favorable response rate (87%), we reduced the possibility of self-selection bias. Third, our sample came from a single firm, which mitigated any spurious results due to company effects.

This study contains several limitations. We adopted a cross-sectional research design, which made it difficult to conclude the causal-effects of the hypothesized relationships. Another limitation of this study lies in the lack of generalizability of the conclusions. The data for this study came from a company from energy industry in China. Therefore the results of the current study may not be able to be generalized to other firms in different industries in China or to organizations in other cultural contexts.

## Conclusion

Creativity has been a long-standing focus of study amongst organizational researchers and managers alike. As organization strives to maintain their sustainable advantage in an increasingly competitive landscape, they need to drive and challenge their employees to be creative. Our study directly addresses this challenge by identifying curiosity as an important trait that drives intrinsic motivation and ultimately creativity. It provides the much needed theoretical and empirical evidences to explain how curiosity influences creativity. More importantly, this study underscores the utility of examining one’s goal orientation in understanding how performance goal orientation and learning goal orientation affect the curiosity-intrinsic motivation relationship.

## References

- Amabile TM. *The social psychology of creativity*. New York: Springer-Verlag; 1983.
- Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. 1996. Assessing the work environment for creativity. *Academy of Management Journal*, 39:1154-1184.
- Amabile, T. M. 1997. Motivating creativity in organizations: On doing what you love and loving what you do. *California Management Review*, 40: 39-58.
- Ambrose, M. L., & Kulik, C. T. 1999. Old friends, new faces: Motivation research in the 1990s. *Journal of Management*, 25,231–292.
- Barron, F. B., & Harrington, D. M. 1981. Creativity, intelligence, and personality. *Annual Review of Psychology*, 32: 439-476.
- Barron, K. E., & Harackiewicz, J. M. 2000. Achievement goals and optimal motivation: A multiple goals approach. *Intrinsic and extrinsic motivation: The search for optimal motivation and performance*: 229-254.
- Baron, R. M., & Kenny, D. A. 1986. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51: 1173–1182.
- Berlyne, D. E. 1955. The arousal and satiation of perceptual curiosity in the rat. *Journal of Comparative and Physiological Psychology*.48:238~246.
- Berlyne, D. E. 1966. Curiosity and exploration. *Science*.153(3731):25-33
- Boyle, G. J. Breadth-depth or state-trait curiosity? A factor analysis of state-trait curiosity and state anxiety scales. *Personality and Individual Differences*, 10, 175-183.
- Button, S. B., Mathieu, J. E., & Zajac, D. M. 1996. Goal orientation in organizational research: A conceptual and empirical foundation. *Organizational Behavior and Human Decision Processes*, 67: 26-48.
- Cacioppo, J. T., Petty, R. E., Feinstein, J. A., & Jarvis, B. G.1996. Dispositional differences in cognitive motivation: The life and times of individuals varying in need for cognition. *Psychological Bulletin*, 119, 2, 197–253.
- Cohen, A. R, Stotland. E, & Wolfe, D. M. 1955. An experimental investigation of need for cognition. *Journal of Abnormal and Social Psychology*, 51,291-294.
- Colquitt, J. S., & Simmering., M.J.. 1998. Conscientiousness, goal orientation, and motivation to learn during the learning process" A longitudinal study. *Journal of Applied Psychology*, 4:654-665.
- Crowe, E., & Higgins, E. T. 1997. Regulatory focus and strategic inclinations: Promotion and prevention in decision-making. *Organizational Behavior and Human Decision Processes*, 69, 117–132.
- Csikszentmihalyi, M .1996. *Creativity: Flow and the psychology of discovery and invention*. NY: Haper Collons, 1996.
- David B. 2000. An introduction to the study of curiosity. Centre for Applied Educational Research, University of Melbourne.
- David B. 2005. From curiosity to identity. Centre for Applied Educational Research, University of Melbourne.
- Davis, G.A. 2004. *Creativity is forever*. Dubuque, IA: Kendall. Hunt Publishing.
- Deci.E. L.1985, *Intrinsic motivation and self-determination in human behavior*. Springer.

- Deci, E. L., Connell, J. P., & Ryan, R. M. 1989. Self-determination in a work organization. *Journal of Applied Psychology*, 74: 580-590.
- Devanna, M. A., & Tichy, N. 1990. Creating the competitive organization of the 21st century: The boundaryless corporation. *Human Resource Management*, 29: 445-471.
- Duda, J. L. 2001. Achievement goal research in sport: Pushing the boundaries and clarifying some misunderstandings. In G. C. Roberts (Ed.), *Advances in Motivation in Sport and Exercise*: 129-182. Champaign, IL: Human Kinetics Books.
- Duda, J. L., & Nicholls, J. G. 1992. Dimensions of achievement motivation in school work and sport. *Journal of Educational Psychology*, 84, 290-299.
- Dweck, C. S. 1999. Self-theories: *Their role in motivation, personality, and development*. Ann Arbor, MI: Psychology Press.
- Dweck, C. S. 1986. Motivational processes affecting learning. *American Psychologist*, 41, 1040-1048.
- Dweck, C. S., & Leggett, E. L. 1988. A social-cognitive approach to motivation and personality. *Psychological Review*, 95, 256-273.
- Edelman, S. 1997. Curiosity and Exploration. California State University, Northridge.
- Edmondson, A. 1999. Psychological safety and learning behavior in work teams. *Administrative Science Quarterly*, 44: 350–383.
- Elliot, A. J., & Church, M. A. 1997. A hierarchical model of approach and avoidance achievement motivation. *Journal of Personality and Social Psychology*, 72, 218–232.
- Festinger, L. 1957, *A Theory of Cognitive Dissonance*. Standford, CA: Standford University Press.
- Feist, G. J. 1998. A meta-analysis of personality in scientific and artistic creativity. *Personality and Social Psychology Review*, 4, 290–309
- Ford, C. M. 1996. A theory of individual creative action in multiple social domains. *Academy of Management Review*: 21, 1112-1142.
- George, J. M., & Zhou, J. 2001. When openness to experience and conscientiousness are related to creative behavior: An interactional approach. *Journal of Applied Psychology*, 86(3): 513-524.
- Gough, H. G. 1979. A creative personality scale for the adjective check list. *Journal of Personality and Social Psychology*, 37: 1398-1405.
- Heider F. 1958. *The psychology of interpersonal relations*. New York: Wiley, 1958. 322 p.
- Herzberg, F., Mausner, B., & Snyderman, B. B. 1959. *The Motivation to Work* (2nd ed.). New York: John Wiley & Sons.
- Hirst, G., Knippenberg, D. V., & Zhou, J., 2009. Cross-level perspective on employee creativity: goal orientation, team learning behavior, and individual creativity. *Academy of Management Review*, 52: 280-293.
- Hirst, G., Knippenberg, D. V., Chen, C. H., Sacramento, C. A., 2011. How does bureaucracy impact individual creativity? A cross- level investigation of team contextual influences on goal orientation- creativity relationships. *Academy of Management Journal*, 54:624-641.
- Kanter, R. M. 1983. *The change masters*. New York: Simon & Schuster.
- Kashdan .T. B., & Fincham, F. D., 2002. Facilitating creativity by regulating curiosity, *American Psychologist*, 57(5), 373-374.

- Kashdan, T. B., Rose, P., & Fincham, F. D. 2004. Curiosity and exploration: Facilitating positive subjective experiences and personal growth opportunities. *Journal of Personality Assessment*.82, 291–305.
- Langevin, R. 1971, Is curiosity a unitary construct? *Canadian Journal of Psychology*.25: 36-374.
- Litman, J. A. 2008. Interest and deprivation dimensions of epistemic curiosity. *Personality and Individual Differences*, 44, 1585–1595.
- Litman, J. A. 2010. Relationships between measures of I- and D-type curiosity, ambiguity tolerance, and need for closure: An initial test of the wanting–liking model of information seeking. *Personality and Individual Differences*, 48, 397–402.
- Litman, J. A., Crowson, H. M., & Kolinski. K. 2010. Validity of the interest- and deprivation-type epistemic curiosity distinction in non-students. *Personality and Individual Differences*, 49, 531–536.
- Litman, J. A., Hutchins, T. L., & Russon, R. K. 2005. Epistemic curiosity, feeling-of knowing, and exploratory behaviour. *Cognition and Emotion*, 19, 559–582.
- Litman, J. A. 2005, Curiosity and the pleasures of learning: Wanting and liking new information. *Cognition and Emotion*, 19(6), 793-814.
- Litman, J. A., & Spielberger, C. D. 2003. Measuring epistemic curiosity and its diversive and specific components. *Journal of Personality Assessment*, 80.75-86.
- Loewenstein, 1994, The Psychology of curiosity: A review and reinterpretation *Psychological Bulletin*, 116(1):75-98.
- Louis, M. R. 1980. Surprise and sense making: What newcomers experience in entering unfamiliar organizational settings. *Administrative Science Quarterly*, 25, 226–251.
- Martindale, C. 1989. Personality, situation, and creativity. *Handbook of creativity*: 211-232. New York: Plenum.
- Maslow, A. H. 1970. *Motivation and Personality* (2nd ed.). New York: Harper and Row.
- Maw, W. H., & Maw, E. W. 1970. Nature of creativity in high-and low-curiosity boys. *Developmental Psychology*, 2(3), 325–329.
- Mumford, M. D., & Gustafson, S. B. 1988. Creativity syndrome: Integration, application, and innovation. *Psychological Bulletin*, 103: 27–43.
- Nicholls, J.G.1984. Achievement motivation: conception of ability, subjective experience task choice, and performance. *Psychological Review*, 91:,328-346.
- Van Yperen, N. W. & Janssen, O. 2002. Fatigued and dissatisfied or fatigued but satisfied? Goal orientations and responses to high job demands. *Academy of Management Review*, 45(6):1161-1171.
- Oldham, G. R., & Cummings, A. 1996. Employee creativity: Personal and contextual factors at work. *Academy of Management Journal*, 39(3): 607-634.
- Piaget, J. 1969. Psychology of intelligence, New York: Littlefield, Adams.
- Runco, M. A. 2004. Creativity. *Annual Review of Psychology*, 55,657–687.
- Ryan, R. M., & Deci, E. L. 2000. Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, 25, 54–67.
- Scott, S. G., & Bruce, R. A. 1994. Determinants of innovative behavior: A path model of individual innovation in the workplace. *Academy of Management Journal*, 37: 580-607.

- Simmons, L. A., & Ren, R. 2009. The influence of goal orientation and risk on creativity. *Creativity Research Journal*, 21(4), 400-408.
- Shalley, C. E. 1995. Effects of coaction, expected evaluation, and goal setting on creativity and productivity. *Academy of Management Journal*, 38: 483–503.
- Shalley, C. E., & Gilson, L. L. 2004. What leaders need to know: A review of social and contextual factors that can foster or hinder creativity. *The Leadership Quarterly*, 15(1): 33-53.
- Shin, S. J., & Zhou, J. 2003. Transformational leadership, conservation, and creativity: Evidence from Korea. *Academy of Management Journal*, 46(6):703-714.
- Spencer, David G. & Myers, Steven 2006. *Social psychology* (3rd Canadian ed. ed.). Toronto: McGraw-Hill Ryerson. [ISBN0-07-095202-7](#).
- Spencer H. H., Sluss, D. M. & Ashforth, B. E. 2011, Curiosity Adapted the Cat: The Role of Trait Curiosity in Newcomer Adaptation. *Journal of Applied Psychology* , 96, No. 1, 211–220
- Steiner, G. A. 1965. Introduction. In G. A. Steiner (Ed.), *The creative organization* (pp. 1–24). Chicago: University of Chicago Press.
- Tierney, P., Farmer, S. M., & Graen, G. B. 1999. An examination of leadership and employee creativity: The relevance of traits and relationships. *Personnel Psychology*, 52(3): 591-620.
- Prabhu,V., Sutton, C. & Sauser, W. 2008, Creativity and Certain Personality Traits: Understanding the Mediating Effect of Intrinsic Motivation, *Creativity Research Journal*, 20:1, 53-66.
- Weick, K. E. 1993. The collapse of sense making in organizations: The Mann Gulch disaster. *Administrative Science Quarterly*, 38, 628–652.
- Woodman, R. W., Sawyer, J. E., & Griffin, R. W. 1993. Toward a theory of organizational creativity. *Academy of Management Review*, 18(2):293-321.
- Zhou, J. 1998. Feedback valence, feedback style, task autonomy, and achievement orientation: Interactive effects on creative performance. *Journal of Applied Psychology*, 83: 261–276.
- Zhou, J., & George, J. M. 2001. When job dissatisfaction leads to creativity: Encouraging the expression of voice. *Academy of Management Journal*, 44(4):682-696.
- Zhou, J., & George, J. M. 2001. When openness to experience and conscientiousness are related to creative behavior: an interactional approach. *Journal of Applied Psychology*: 3, 513-524.
- Zhou, J., & George, J. M. 2003. Awakening employee creativity: The role of leader emotional intelligence. *The Leadership Quarterly*, 14: 545-568.

**Table 1 Descriptive Statistics, Correlations, and Reliabilities**

Variable	M	SD	1	2	3	4	5	6	7	8
1.Age	38.01	6.85	-							
2.Education	2.85	0.68	-.12**	-						
3.Tenure	3.08	0.95	.29**	-.13**	-					
4.Curiosity	4.74	0.69	-.05	-.02	-.03	(.79)				
5.Intrinsic motivation	4.55	0.88	-.09*	-.01	-.03	.64**	(.86)			
6.Performance orientation	3.79	1.04	.01	-.02	.06	.01	.14**	(.87)		
7.Learning orientation	4.96	0.79	-.01	-.04	.02	.36**	.30**	.26**	(.94)	
8.Creativity	4.31	0.98	-.01	.01	-.02	.11**	.15**	-.05	.06	(.95)

Note. Internal consistency reliabilities are in parentheses. N=599; \*p < .05; \*\*p < .01.

**Table 2 Results of Regression Analysis for Mediation**

Independent Variables	Model 1:		Model 2:
	Intrinsic Motivation	Creativity	
<b>Controls:</b>			
Age	-.09		-.01
Education	-.01		-.01
Tenure	.00		-.02
$\Delta R^2$	.00		.00
<b>Direct effects:</b>			
Curiosity	.64**		.09*
$\Delta R^2$	.41**		.01*
<b>Mediating effects:</b>			
Curiosity		-.01	
Intrinsic motivation		.16**	
$\Delta R^2$		.02**	
Overall R <sup>2</sup>	.41		.02*
Overall model F	89.40**		5.97**

Note: N=599; \*p<.05; \*\*p<.01.

**Table 3 Results of Hierarchical Regression Analysis<sup>a</sup>**

<b>(a) Moderating Effects of Performance Orientation on the Curiosity-Intrinsic Motivation Relationship<sup>b</sup></b>	
<b>Variables</b>	<b>Intrinsic Motivation</b>
<b>Control Variables</b>	
Age	-.09
Education	.00
Tenure	-.22
$\Delta R^2$	.01
$\Delta F$	1.33
<b>Main Effects</b>	
Curiosity	.64**
Performance Orientation	.11**
$\Delta R^2$	.43**
$\Delta F$	74.60**
<b>Hypothesized Moderating Effects</b>	
Curiosity×Performance Orientation	-.07*
$\Delta R^2$	.43**
$\Delta F$	63.37**

<b>(b) Moderating Effects of Learning Orientation on the Curiosity-Intrinsic Motivation Relationship<sup>b</sup></b>	
<b>Variables</b>	<b>Intrinsic Motivation</b>
<b>Control Variables)</b>	
Age	-.09
Education	.00
Tenure	-.01
$\Delta R^2$	.01
$\Delta F$	1.33
<b>Main Effects)</b>	
Curiosity	.62**
Learning Orientation	.07*
$\Delta R^2$	.42**
$\Delta F$	72.15**
<b>Hypothesized Moderating Effects</b>	
Curiosity×Learning Orientation	.06*
$\Delta R^2$	.42**
$\Delta F$	60.80**

Note: N=599. Values are standardized coefficients, with standard errors in parentheses.

\*  $p < .05$ ; \*\*  $p < .01$  (one-tailed test).