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The 3 × 2 Achievement Goals Model and University Students' Agentic Engagement: The Mediating Role of an Epistemic Emotion

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ABSTRACT

Previous studies generally showed that achievement goals are linked with academic engagement. However, the association between the newly-developed model of achievement goals (i.e. the 3×2 model) and agentic engagement has received relatively little attention. Furthermore, the underlying mechanism of this relationship is unclear, more specifically, among university students and guided by the assumptions of the control-value theory of emotions, epistemic curiosity might be a potential mediator. The current study aimed to explore the mediating role of epistemic curiosity in the relationship between achievement goals and agentic engagement among 350 university students from Ferdowsi University of Mashhad in the academic year of 2019-2020. Participants completed the measures of the Achievement Goals Questionnaire, Epistemic Curiosity Scale, and Agentic Engagement Scale. Data analysis was performed using SPSS version 24.0 and AMOS software. The findings showed that epistemic curiosity significantly mediated the association between approach goals and avoidance goals with agentic engagement (P<0.001). Overall, the findings offer new evidence on the association between variables of the present study and shed light on the underlying processes providing some theoretical and practical implications.

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Introduction

Academic engagement, as a psychological investment toward learning, represents self-initiated and goal-oriented participation in academic activities, characterised by positive emotional states (Salamonson et al., 2009). Engagement is usually considered a multidimensional construct, and as noted by Fredricks et al. (2004), it consists of cognitive, behavioral, and emotional dimensions. Although Fredricks et al's (2004) trichotomy of academic engagement has been widely used by researchers (Burić & Frenzel, 2020; Haji, & Abdollahpour, 2021; Mckeller & Wang, 2023; Salas-Pilco et al., 2022), these dimensions mainly focus on the learners' reactions to teacher-provided and teacher-initiated activities (Reeve, 2012), neglecting the agency and proactive forms of engagement that characterize constructive learning (Montenegro, 2019). Students not only react to learning activities, but also create learning opportunities, and internalize those activities (Bandura, 2018). In turn, a fourth dimension of engagement, agentic engagement, was proposed (Reeve, 2012). Agentic engagement refers to the active contribution to the flow of the learning process by making it more involving (Eriksen & Bru, 2023; Makarim & Primana, 2023; Matos et al., 2018). It also refers to the voluntary and self-initiated activities of learners who intentionally show agency in their learning (Goodman, 2016). Although all facets of students' engagement are interdependent, agentic engagement has the unique characteristic of giving students the means to foster a more supportive and dynamic learning environment for themselves (Reeve, 2013).

A key factor in academic engagement is achievement goals (Bong, 2009; Elliot et al., 1999). Studies based on achievement goal theory (Elliot, 2005) state that engagement in academic activities follows the goals adopted by students in the learning process (Bong, 2009; Elliot et al., 1999). The achievement goal theory is a motivational framework in which achievement goal is defined as the aim for engaging in achievement behavior (Ames, 1992; Elliot, 2005). Most goal achievement theorists distinguish between two goals which are mastery goals, in which the purpose is to improve competence and task mastery, and performance goals, in which the purpose is to demonstrate competence (Elliot & Hulleman, 2017). Over the last few decades, various models of achievement goals have been proposed and extended (Elliot et al., 2011).

The latest model of achievement goals was proposed by Elliot et al. (2011), who expanded the 2 × 2 model of achievement goals into a 3 × 2 model. In this model, Elliot et al. (2011) revised the construct of achievement goals by providing a more precise definition based on competence alone. Achievement goal theorists have examined individuals' competencies from the perspective of how individuals define their competence and how they value it (Daumiller et al., 2021). Competence is defined based on absolute, intrapersonal, and normative standards. Individuals who have absolute standards define their competence in terms of task mastery. Individuals with intrapersonal standards evaluate their competence based on their internal abilities and the progress they have made compared to the past. Individuals with normative standards feel competent when they perform better than others (Elliot & McGregor, 2001). The three standards used to define competence, along with the two ways that competence can be valued (approaching success and avoiding failure), result in a 2×3 model of achievement goals including six goal constructs: task-approach, task-avoidance, self-approach, self-avoidance, other-approach, and other-avoidance (Elliot et al., 2011). A review of the outcomes of these goals in different domains elucidates the role of this multidimensional construct in learning situations.

A growing body of research has indicated that achievement goals are associated with self-regulation and academic performance (Kord, 2018; Liu et al., 2023; Xu et al., 2024). Research has also documented that achievement goals lead to distinct patterns of motivational and academic engagement outcomes (Biggs, 2011). Most studies have indicated a positive relationship between approach-mastery and approach-performance goals with intrinsic motivation, perceived competence, and academic engagement, as well as a negative relationship between avoidance-performance goals and academic engagement (Dela Rosa, 2010; Hemmati et al., 2018; Zare et al., 2019). Students with mastery goals show the necessary effort to achieve their goals and are always looking for situations and challenges that enhance their learning and persist in overcoming failures and setbacks (Kaplan & Flum, 2010). Therefore, they are more likely to be engaged in classes. Despite the general agreement on the positive impact of mastery goals on motivation and engagement, the evidence for the negative relationship between avoidance goals and negative consequences remains unclear. For instance, some studies have shown a positive relationship between avoidance-performance goals and some aspects of academic engagement and achievement (Duchesne et al., 2019; Frumos et al., 2024; Makarachi & Jafari, 2019).

Despite the valuable contributions of achievement goals theory, most studies have focused on the traditional models of achievement goals. The 3×2 model of achievement goals distinguishes between self-based and task-based goals previously referred to as mastery

goals in previous models and also emphasizes on the key concept of competence (Elliot et al., 2011). In addition, Elliot and colleagues (2011) asserted that each of the goals in the 2×3 model has unique patterns of antecedents and outcomes. This issue necessitates addressing the antecedents and outcomes of achievement goals separately within the 3×2 model.

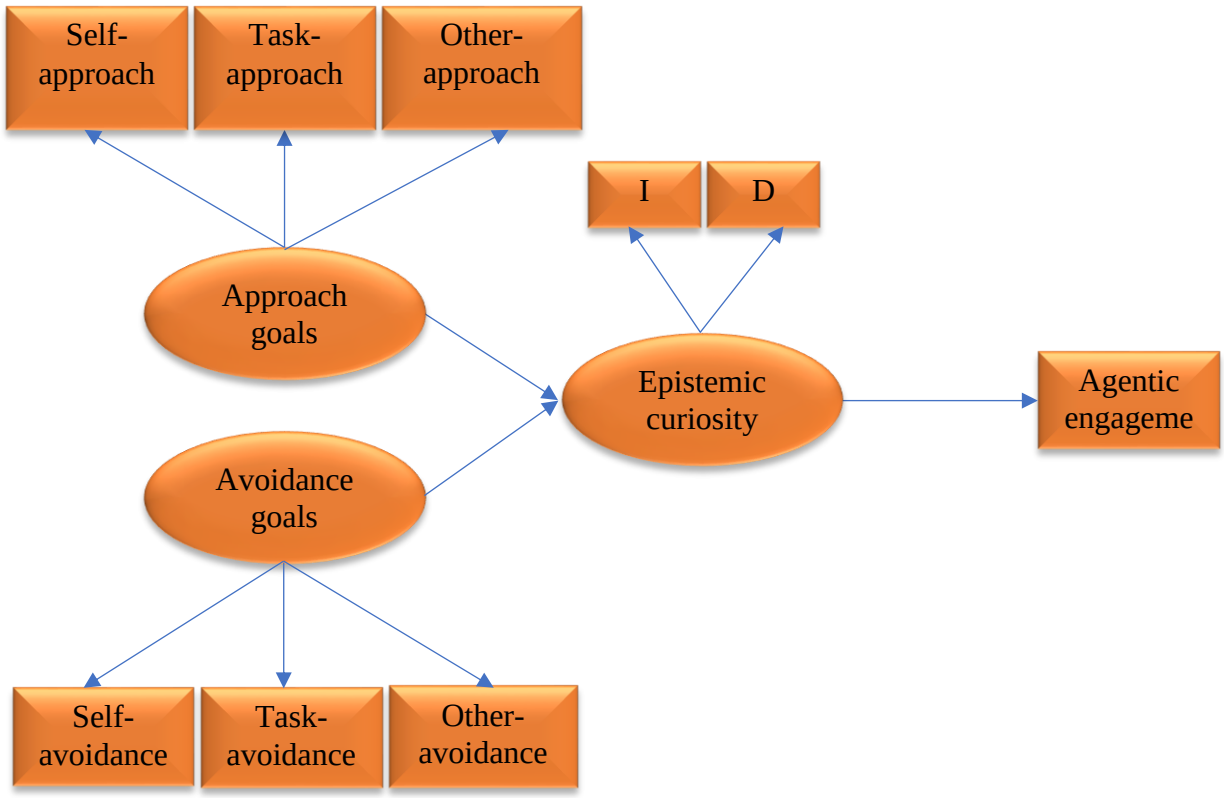
As mentioned, although one of the important outcomes of achievement goals is the various dimensions of academic engagement, few studies have specifically addressed the agentic dimension. Hence, as agentic engagement is the only dimension that more comprehensively explains the role of motivation in academic achievement (Reeve & Tseng, 2011) and to understand how students enrich learning activities, this dimension was considered in this study. Another reason for choosing agentic engagement is the inability of other traditional dimensions of academic engagement to explain intentional and active participation. Likewise, based on the theoretical foundations of achievement goal theory, it is unclear how achievement goals could impact engagement and potentially, one of the mechanisms that can fill this gap is academic emotions (Pekrun et al., 2006).

Emotions directly related to achievement outcomes or activities are called academic emotions (Pekrun et al., 2002). As noted by Muis et al (2015), one important category of academic emotions which has been neglected in the literature is called epistemic emotions. Epistemic emotions are emotions that arise as a result of the cognitive facets of information and the processing of that information experienced during challenging tasks (Pekrun & Stephens, 2012). These emotions include curiosity, surprise, confusion, anxiety, frustration, and boredom (Pekrun & Linnenbink, 2012). Among these, only curiosity, surprise, and confusion are inherently epistemic and do not belong to any other categories of academic emotions. Curiosity is defined as a motivational-emotional state that aims at acquiring new knowledge through observation, thinking, and asking questions to stimulate exploration (Litman, 2010). Curiosity creates the motivational basis for effective engagement in the classroom (Ryan & Deci, 2002). There are several reasons to consider curiosity, as a mediator variable in this study. First, some students find many learning materials complex and demanding. Second, when students encounter uncertain and controversial learning content, often experience a wide range of emotions. Hence, in such situations, they are more likely to react emotionally than logically. Third, the antecedents and consequences of curiosity have not been explored precisely (Kim & Choi, 2019).

Epistemic curiosity is the desire to acquire new knowledge that is expected to arouse interest (type 1) or to eliminate information deprivation (type 2). Interest-type curiosity is experienced when individuals seek opportunities to enjoy discovering new things, and deprivation-type curiosity occurs when individuals lack sufficient information. In academic contexts, interest-type curiosity, which is an intrinsic motivation for acquiring new knowledge, is related to mastery-approach goals that lead to increased interest and engagement by increasing positive emotions (Litman, 2008). Deprivation-based epistemic curiosity also exists in mastery-approach goals, but is more related to performance-approach goals, because the accuracy and value of new knowledge acquired is important for achieving goals. In other words, individuals with mastery-approach goals, focus on developing their abilities, experience positive emotions that facilitate the use of flexible learning strategies, and support self-regulation (Pekrun et al., 2011). Conversely, avoidance-performance goals require a lack of controllability and negative value of normative outcomes and are therefore expected to have a detrimental effect (Pekrun et al., 2011).

Accordingly, research evidence supports the relationships between achievement goals, academic emotions, and academic engagement (Baneshi et al., 2014; Bordbar & Yousefi, 2015; Daniels et al., 2008; Rabbani & Hejazi, 2019). However, to our knowledge, no other study has tested the relationship between the 3×2 model goal constructs with curiosity and agentic engagement. Thus, the present study examined the mediating role of curiosity in the relationship between the six dimensions of achievement goals and agentic engagement. The hypothetical model of the research is presented in Fig. 1.

Figure 1.
Proposed Model of Predicting Agentic Engagement Based on Achievement Goals and Curiosity



Method

Design

To examine the research questions a descriptive-correlational research design was applied. It particularly sought to explain and discover the role of achievement goals and epistemic curiosity in agentic engagement. Descriptive statistics and correlation analysis were performed using SPSS 24.0, and AMOS 24.0 software was used to perform a mediation model.

Participants

According to Fritz and MacKinnon (2007, p. 14), 200 participants are the minimum sample size for conducting mediational research with 0.80 statistical power and medium (0.30) effect size. In this study, a sample of 350 students was used, meeting and exceeding the minimum sample size. However, 23 questionnaires were deemed invalid or incomplete. The final sample included 327 volunteer students aged 18 to 40 years (M = 21.55; SD = 3.37), of which 169 were female (51.7%) and 158 were male (48.3%), from Ferdowsi University of Mashhad. In terms of marital status, 291 were single (88.8%) and 36 were married (11.2%). Most participants were freshmen (27%) followed by seniors (25.8%), sophomores (23.9%), and juniors (23.3%). The sample was selected by random cluster sampling. After collecting the questionnaires and data, statistical tests and structural models were performed using SPSS 24.0 and Amos software. The confidentiality and anonymity of the participants were assured. Likewise, informed consent was obtained from all participants in the study.

Instruments

3 x 2 Achievement Goal Questionnaire (AGQ)

This questionnaire was developed by Elliot et al. (2011). The AGQ is an 18-item measure that was created to assess each of the six dimensions of achievement goals. The AGQ has six subscales, including self-approach (My aim is to perform better than my previous performances), task-approach (My aim is to know the correct answers to the questions), other-approach (My goal is to perform better than all the other students), self-avoidance (My goal is to avoid performing worse than my usual level of performance), task-avoidance (My aim

is to avoid giving wrong answers), and other-avoidance (My aim is to avoid performing worse than the other students). Each goal has three items. The responses are based on a 7-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree). The Cronbach's alpha coefficients of the six subscales ranged from 0.83 to 0.92 (Elliot et al., 2011). The instrument was translated to Persian by Panahipour et al. (2018). In Panahipour et al.'s (2018) study, Cronbach's alpha coefficients ranged from 0.79 to 0.84 and a six-factor structure of achievement goals was also confirmed. In this study, Cronbach's alpha coefficients ranged from 0.75 to 0.88 for all subscales.

Epistemic Curiosity Scale (ECS)

This scale was developed by Litman and Spielberger (2003). This self-reported scale comprises 10 items that assess two aspects of epistemic curiosity: interest (5 items; e.g. I enjoy exploring new ideas) and deprivation (5 items; e.g. I brood for a long time in an attempt to solve some fundamental problem). The responses are based on a 4-point Likert scale ranging from rarely (1) to almost always (4). Cronbach's alpha coefficients for the aspects of the scale were higher than 0.80 in the study by Litman and Spielberger (2003) and the results of exploratory and confirmatory factor analysis also confirmed a two-factor structure. The psychometric properties of the scale were tested in an Iranian sample and the results indicated the validity and reliability of the scale at an acceptable level (Bordbar & Yousefi, 2016). In the present study, the reliability of each scale was as follows: interest: Cronbach's α = .86; deprivation: Cronbach's α = .83.

Agentic Engagement Scale (AES)

This scale was originally developed by Reeve (2013) as the fourth component of academic engagement and has 5 items (e.g. during class, I ask questions). The responses are based on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). Cronbach's alpha coefficient was 0.86. The results of factor analysis in Reeve's study (2013) supported the four-component structure of academic engagement. This scale was validated in Iran by Ramezani and Khamesan (2017) and the internal consistency of the agentic engagement component was reported as 0.85 by Cronbach's alpha and the results of confirmatory factor analysis also indicated a good fit of the model for Iranian students. In the current study, Cronbach's alpha coefficient was 0.81.

Findings

First, to ensure that the research data meet the basic assumptions of the structural equation modeling method, several main assumptions of the structural equation modeling were investigated.After excluding missing data and outliers from the dataset, preliminary analyses were carried out to explore the observed scale characteristics, assumption of normality, and correlations between variables. In terms of normality, preliminary analyses indicated that skewness and kurtosis scores ranged from −.64 to .53, suggesting that all variables had normal distributions (Curran et al., 1996). Following this, bivariate analyses were calculated to test the associations between the research variables using Pearson's correlations. Correlation results showed that approach goals (*r* range = .03 to .23) and avoidance goals (*r* range = −.15 to -.01) were significantly associated with curiosity while the correlation between achievement goals and agentic engagement was not significant. Additionally, both interest and deprivation components of epistemic curiosity were positively correlated with agentic engagement.

Table 1
Descriptive Statistics for Study Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
self-approach goal	8.92	2.82	4	15
task-approach goal	8.76	2.84	3	15
other-approach goal	8.85	2.85	3	15
Self-avoidance goal	9.07	2.78	3	15
task-avoidance goal	9.04	2.70	3	15
other-avoidance goal	8.94	2.78	3	15
epistemic curiosity (I type)	12.77	4.31	5	20
epistemic curiosity (D type)	12.71	4.03	5	20
agentic engagement	14.61	6.18	5	25

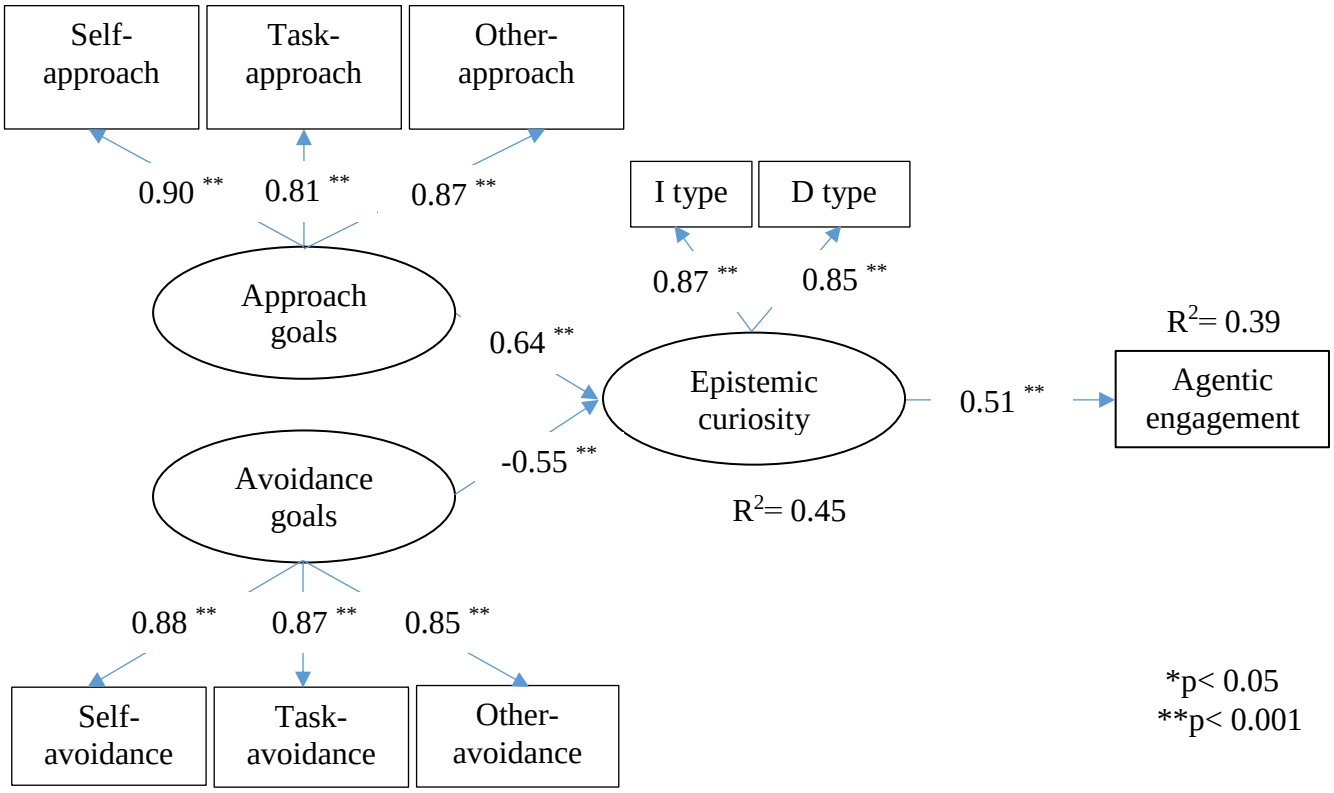
To determine the overall fit of the model, 8 indicators were considered (Table 2), to achieve a better fit of the model, the non-significant path (direct relationship between achievement goals and agentic engagement) was removed from the model. The fit indices after modification indicated the good fit of the model.

Table 2
Model Fit Indices

Fitness Index	X^2/df	GFI	AGFI	CFI	NFI	IFI	TLI	RMSEA	PCLOSE
Amount	2.17	0.97	0.96	0.97	0.95	0.98	0.94	0.05	0.36

The results of the analysis of the measurement models and the structural model are shown in Figure 2. The results of the analysis of the measurement models related to the three latent variables (approach goals, avoidance goals, and epistemic curiosity) showed the significance of the regression coefficients related to the three models, which indicates that all indicators are representative of the related latent variables.

Figure 2.
Structural Equation Model Predicting Students' Agentic Engagement



The results of the analysis of the structural model, i.e. the direct effect of the latent variables in the model and the estimate of the indirect effect, using Bootstrap (with a confidence interval of 95%), indicate that the variables of approach goals and avoidance goals have a direct and significant effect on the epistemic curiosity. The direct effect of goals on students' agentic engagement was insignificant, which was initially removed from the model. Also, approach goals, due to epistemic curiosity, have an indirect, positive and significant effect on their agentic engagement. Avoidance goals, through

epistemic curiosity, negatively and significantly predict agentic engagement.

Table 3 shows all the direct, indirect and total effects in the structural equation model. In general, according to the results of the analysis, it can be stated that epistemic curiosity plays a mediating role in the relationship between students' achievement goals and agentic engagement, and this model has been able to account for 39% of the agentic engagement variance with the two variables of achievement goals and epistemic curiosity.

Table 3
Direct, Indirect and Total Effects in Model

Path		Direct effect	Indirect effect	Total effect	Explained Variance
To epistemic curiosity	From approach goals	0.64**	-----	0.64**	45%
	From avoidance goals	-0.55**	-----	0.55**	
To Agentic Engagement	From approach goals	----	0.48**	0.48**	39%
	From avoidance goals	----	0.41*	0.41*	
	From epistemic curiosity	0.51**	----	0.51**	

*P< 0.01 **P< 0.001

Discussion

This study aimed to explore the mediating role of students' epistemic curiosity in the relationship between 3 × 2 achievement goals and agentic engagement. Results indicated that the hypothesized SEM model fit the data well, and all paths were statistically significant: (a) approach goals were positively associated with epistemic curiosity, (b) avoidance goals were negatively related to epistemic curiosity, (c) epistemic curiosity was positively associated with agentic engagement, and (d) epistemic curiosity mediates the relationship between achievement goals and agentic engagement.

First, results showed a significant positive relationship between approach goals (i.e. task-approach, self-approach, and other-approach) and epistemic curiosity, suggesting that individuals with a higher tendency to attain competence were more likely to experience curiosity. This result is consistent with previous findings (e.g., Huang, 201; Pekrun et al., 2011). It can be stated that students who adopt approach goals seek to acquire new knowledge, understand learning topics, develop their competencies, and master tasks. Therefore, when faced with new or ambiguous learning situations, they experience curiosity. The findings also indicated that avoidance goals were negatively related to curiosity. According to the control-value theory of achievement emotions (Eliiot et al., 2011), students who typically avoid failure do not expose themselves to challenging situations. Hence, they are less likely to experience emotions such as curiosity or confusion. This result was in line with previous findings indicating a negative relationship between avoidance goals and positive emotions (Haung, 2011; Pekrun et al., 2009).

Our findings indicated that epistemic curiosity was positively associated with agentic engagement. In line with prior research, when people are more curious, they devote more attention to an activity, process information more deeply and remember it better, and as a result, there is a greater possibility to persist with tasks until the goals are met (Silvia, 2006). Therefore, the behaviors such as asking questions, expressing preferences and desires, and active participation in the classroom, which is the result of people's curiosity, will be higher (Litman, 2005).

The current study findings extend prior research by supporting epistemic curiosity as a key factor that mediates the relationship between achievement goals and agentic engagement. Our findings expand current models of achievement goals and their impact on academic engagement, more specifically, agentic engagement to include curiosity as a major factor and further highlight the other types of epistemic emotions (i.e. surprise, confusion) that center learning emotions. This finding is in line with prior studies (Cheng et al., 2023; Cheng, 2023). The control-value theory of academic emotions maintains that individuals with approach goals focus on the positive value of activities and learning outcomes, the controllability of such activities and outcomes, and the attainability of competence (Chen et al., 2023; Goetz et al., 2016). The motivation for success can elicit positive emotions such as curiosity and as a result, can lead to task engagement (Elliot et al., 2011).

Conclusions

Individuals with approach goals strive the learn new materials and skills even if they fail to achieve their

goals. Therefore, they have more intrinsic motivation and deeper engagement in the learning process (Alhadabi & Karpinski, 2020). Even students whose approach goals are oriented towards obtaining favorable judgments from others make more effort to perform better on tasks (Alhadabi & Karpinski, 2020) and are likely to show more curiosity when faced with new stimuli. On the other hand, students with avoidance goals (self-avoidance, task-avoidance, other-avoidance) focus on failure and regulate their behavior by avoiding these negative possibilities. Such focus on failure triggers and sustains threat, anxiety, and hypervigilance (Pekrun et al., 2009). These distressing processes lead to concerns about self-worth that prevent full investment in activities and interfere with attention to tasks (Elliot et al., 2011).

The current study demonstrated that achievement goals are indirectly predictive of agentic engagement, as their impact depends on epistemic curiosity. To date, little is known about the unique relationship between 3×2 achievement goals, with agentic engagement, particularly in university students. The current study found further evidence for the newly developed 3 × 2 conceptualization and the control-value theory of achievement emotions, linking approach and avoidance goals to an epistemic emotion (i.e. curiosity).

The present research model excluded the direct effect of 3 × 2 achievement goals. Achievement goals only influenced students' agentic engagement through the mediation of positive emotions such as curiosity. The findings of the current study extend our understanding of curiosity and its relationship to students' agentic engagement and situate epistemic emotions as a construct that may change the association between distinct achievement goals and academic engagement.

Implications and Future Orientations

This study has many theoretical and practical applications. Theoretically, the findings of the current research provide strong empirical evidence in support of the control-value theory of achievement emotions (Elliot et al., 2011). In addition, most of the studies conducted to explain the factors affecting academic engagement have mainly focused on the dichotomy model of achievement goals, as well as, negative emotions (e.g. anxiety). The current study extends the literature by exploring the 3 × 2 achievement goals model and an under-researched dimension of academic emotions, called epistemic emotions. Furthermore, according to a broad consensus in the literature, academics play a key role in facilitating the pursuit of approach-based goals and preventing the pursuit of avoidance-based goals in learning contexts (Murayama & Elliot, 2009). There are several limitations, which may be addressed in future research. First, our findings were based on cross-sectional data, so causal inferences cannot be made. A longitudinal research design would be beneficial to come closer to establishing causality. A second limitation of the present study was an exclusive focus on undergraduate students in one single university, thus, our findings cannot be generalized to other samples of different ages. Future research would do well to explore the 3 × 2 model with younger students. Finally, our study only examined curiosity as an epistemic emotion. Future studies can explore other epistemic emotions (e.g. surprise, confusion).

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Conflicts of Interest

No conflicts of interest is declared.

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