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RESEARCH ARTICLE

Achievement goal orientation and academic social comparison emotions in competitive learning environments: Latent profile analysis approach

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ABSTRACT

High school students often encounter competitive learning environments of which they can influence their achievement goal orientation and academic social comparison emotions. This study investigates potential patterns of achievement goal orientation and academic social comparison emotions among high school students in competitive learning environments. A total of 397 South Korean high school students participated in this study. Adopting the person-centered approach, latent profile analysis was employed, and the selected class model was validated by comparing grades and self-esteem across identified classes using the BCH method. This study identified six distinct classes of which three profiles (first, third, fourth classes) had similar configurations but different profile levels, which fit the features of multiple goals. The second and sixth classes presented elevated performance goals and contrast emotions. Lastly, the fifth class exhibited a separate configuration, which had elevated mastery-approach goals and assimilation emotions. Analysis of outcome measures revealed that classes with elevated performance goals showed low self-esteem despite relatively high academic grades. It revealed that in competitive learning environments, performance goals were found to co-occur with contrast emotions in academic social comparison, while mastery goals co-occurred with assimilation emotions. This implies that those who endorse mastery goals tend to see themselves as similar to the comparison target, while those who endorse performance goals tend to see themselves dissimilar to the comparison target. This finding warrants further exploration to understand the underlying mechanisms. This study recommends supporting mastery-approach goals in competitive learning environments.

Keywords: Achievement goal orientation; social comparison; academic social comparison emotions; latent profile analysis; South Korean

1. Introduction

In South Korea, high school students undergo intense relative evaluations in each semester[1]. This system ranks students into nine categories, each with a designated percentage. For example, the top 4% of students are classified as first-rankers[2]. Societal demands to differentiate students based on their academic performance have driven the implementation of this relative evaluation system. Under this system, students become more concerned with their academic ranks rather than what they have learned in classes[1]. This system amplifies the

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significance of achieving high rankings in academic grades. Thus, the relative evaluations foster social comparisons among students, yielding both explicit and implicit competitions in the classroom.

The competitive learning environment is expected to influence both students' endorsement of achievement goal orientation[3] and engagement in academic social comparison emotions[4]. Specific types of achievement goal orientation could be tied to particular social comparisons in classrooms. For instance, individuals with performance goals, focusing on outperforming others, inherently concern themselves with their relative standing[5,6]. In addition, social comparison gives rise to accompanying emotions such as envy and pride[7].

The current study posits that certain types of achievement goal orientation leads to specific academic social comparison emotions. The term 'academic social comparison (ASC) emotions' in this study is used for social comparison emotions occurring in the context of learning. Given the potential interplay between achievement goal orientation and social comparison emotions, this study intended to identify latent classes of achievement goal orientation co-occurring with ASC emotions. Investigating such latent classes among high school students would provide better descriptions of student subgroups rather than merely examining achievement goal orientation alone. This study employs the person-centered approach of latent profile analysis to identify potential profiles of achievement goal orientations alongside ASC emotions in competitive learning environments.

2. Literature review

2.1. Achievement goal orientation

The initial definition of achievement goal orientation, which was underlying reasons or purposes for engaging in competence-relevant activities[8], was criticized for its vagueness[9,10]. Later, it was defined as specific aims that are represented as specific end-states[11]. Its subtypes are divided based on whether the goal is set for personal improvement and development or to gain normative superiority to others. Initially, achievement goal theorists presented dichotomous models of achievement goal orientation that contrasted two types of goals, which are named slightly different depending on each theorist; performance-learning goals[12], task-ego orientations[13], mastery and ability goals[14], and mastery-competitive goals[15]. A three-factor model was later developed, adding another dimension of approach and avoidance to performance goals[16]. Furthermore, a 2x2 model was proposed to categorize mastery and performance goals with the dimensions of approach and avoidance[17,18]. In the 2x2 model, mastery-approach goals focus on the development of one's abilities to master given tasks, while mastery-avoidance goals aim to avoid the possibility of failing given tasks. On the other hand, performance-approach goals are aimed at achieving higher performance and competence than others, while performance-avoidance goals aim to avoid being judged as incompetent[17,19].

The multiple goal perspective, which suggests that individuals pursue more than one achievement goal simultaneously, has gained empirical support[20,21]. The multiple goal perspective claims that pursing both mastery-approach and performance-approach goals leads to optimal motivation[22-24]. Through the adoption of person-centered analysis methods, achievement goal research has advanced, enabling the assessment of the combined effects of achievement goals based on the person-centered method[20,21,25].

Tuominen-Soini et al. [20] assessed the achievement goal orientation of 1,371 children in Finland and identified six latent profiles. Among the six profiles, the Success-oriented group (i.e., characterized by high levels of mastery-extrinsic and performance-approach goals) achieved the highest grades but also reported the highest emotional exhaustion. In contrast, the Mastery-oriented group displayed the most adaptive patterns in terms of self-esteem, depression, and school-related burnout. A study conducted by Kim et al. [26] with a sample

of South Korean students identified four profiles: low-goals, performance-salient goals, mastery-salient goals, and high-goals. The mastery-salient goals group exhibited the highest levels of learning strategies, demonstrating the most adaptive pattern.

In another study[27] with a sample of 480 Singaporean middle school students, after identifying patterns of achievement goal orientation, Jang and Liu. examined differences across clusters on the measures of learning strategies, achievement emotions, and mathematics performances. They reported that high mastery approach and low mastery avoidance clusters had most optimal results in terms of learning strategies, achievement emotions, and performance while the high multiple goals cluster had mixed results including high anxiety and moderate boredom.

Collectively, the current literature on achievement goal orientation highlights the mastery high profile as associated with the most desirable outcomes such as self-esteem, depression, self-regulation, motivation, achievement emotions, and engagement. However, while the mastery high profile demonstrated relatively high academic achievement, it did not rank the highest[18]. Further research is required to elucidate the effects of achievement goal orientation on learning outcomes.

2.2. Academic social comparison emotions

Students spend a lot of their time at school, where they are frequently exposed to comparing themselves with others or being compared by others. This exposure often elicits intense and stimulating emotions due to the inherently self-evaluative nature of social comparison. The existing literature on emotional experiences in learning contexts primarily focuses on achievement emotions[28]. However, achievement emotions do not seem to parsimoniously categorize the emotional experiences in students' daily settings.

Adopting the framework of social comparison emotions could closely capture the affective responses that students experience in relation to their academic achievement. Derived from Festinger's social comparison theory[29], Smith[7] developed the theory of social comparison emotion. Social comparison is the act of obtaining information about oneself in relation to others when there is no objective standard[29]. It is carried out with the motivation of self-evaluation[29], self-enhancement[30], or self-improvement[31]. Another line of research[32,33] focuses on the social cognitive processes of social comparison, explaining how self-evaluative consequences of social comparisons occur based on informational processes. Smith[7] organized social comparison emotions into four types: upward assimilation, upward contrast, downward assimilation, and downward contrast.

Upward emotions arise from comparing oneself with perceived superiors, while downward emotions stem from comparisons with perceived inferiors[7]. Upward assimilation emotions involve feelings of similarity to comparison targets or self-enhancement, encompassing optimistic hope, admiration, and inspiration[7]. Upward contrast emotions occur when differences between oneself and comparison targets seem insurmountable, leading to depression, shame, resentment, and envy[7]. Downward assimilation emotions emerge when one perceives the potential to become similar to the comparison target, featuring worry, fear, pity, and sympathy[5]. Downward contrast emotions arise from comparisons with inferiors, evoking pride, contempt, and schadenfreude[7]. One underlying dimension of these four types is the sense of control over the gap between oneself and comparison targets. Engaging in upward assimilation and downward contrast emotions indicates the comparer’s sense of control over the gap while engaging in upward contrast and downward assimilation does not.

The existing literature that examined social comparison emotions has particularly focused on the social networking context[34,35]. A few studies have applied social comparison emotions to the emotional experiences of students in the classroom. For instance, Buunk et al. [36] examined social comparison emotions by identifying

the types of social comparison emotions in the classroom. They found that students showed more upward than downward social comparison emotions, more assimilation than contrast emotions, and more self-focused than other-focused emotions. This study is limited to identifying frequent types of social comparison emotions, which does not provide information about emotions in relation to achievement and learning. This study seeks to investigate the academic social comparison emotions that co-occur with academic goal orientation.

2.3. The connection between academic goal orientation and academic social comparison emotions

The literature has recognized the significant relationships between achievement goal orientation and emotional experiences. For instance, Pekrun et al. [37]found that mastery goals were positively associated with enjoyment, hope, and pride while negatively associated with boredom, anger, hopelessness, and shame. Additionally, performance-approach goals were positively associated with hope and pride. In contrast, performance-avoidance goals were positively associated with anger, anxiety, hopelessness, and shame, and negatively associated with hope and pride. Huang[38] conducted a meta-analysis study of achievement goals and achievement emotions, coding achievement emotions with indicators of discrete achievement emotions. Indicators of interest, enjoyment, hope, pride, and positive affect were grouped into positive achievement emotions, while indicators of anxiety, shame, anger, worry, boredom, and negative affect were grouped in negative achievement emotions. Based on 78 correlational studies, Huang found that the effect sizes varied depending on the types of achievement goals. The mastery-approach goals consistently showed strong relationships with positive achievement emotions and weak relationships with negative achievement emotions. The findings of the other achievement goals were inconsistent or non-significant. These findings suggest that the relationship patterns between achievement goal orientation and achievement emotions are not yet fully understood and require further examination.

In understanding the connection between different achievement goals and academic social comparison (ASC) emotions, this study adopted two conceptual perspectives from previous studies. First, the connections between achievement goals and ASC emotions are not limited to performance goals. Research has found that individuals with mastery goals, despite their lack of an explicit interest in outperforming others, engage in social comparison to glean self-evaluative information[39,40]. Thus, individuals who pursue mastery goals are also expected to experience ASC emotions. Second, achievement goals and ASC emotions are closely related. Individuals with performance goals tend to attribute their learning outcomes to abilities and perceive their abilities to be fixed[3]. Consequently, they may perceive the gap between themselves and comparison targets as unbridgeable, leading to upward contrast or downward contrast emotions. On the other hand, individuals with mastery goals focus on developing their competencies[10] and tend to have a sense of control over their learning process[41]. These individuals are likely to engage in upward assimilation comparison emotions, which are characterized by self-improvement motives[14] and a perceived control over the gap between themselves and the comparison target[7].

Adopting the theories of achievement goal orientation and social comparison emotion, the current study posits that achievement goal orientation and ASC emotions are closely related and co-occur, significantly impacting students' learning experiences. Thus, it is worth to investigate the latent classes of achievement goal orientation along with academic social comparison emotions among high school students.

2.4. The current study

Building on established theories of achievement goal orientation[12,17,19,22], and social comparison emotions[7], emotions. Our research questions were formulated as follows. First, we took an exploratory approach to identify the potential latent classes in students' endorsement of achievement goal orientation and

engagement in ASC emotions. This led to two research questions: a) What latent profiles emerge from the combination of achievement goal orientation and ASC emotions? b) Do differences exist in self-esteem and grades among identified classes of achievement goal orientation and ASC emotions? Second, we investigate patterns of configurations between achievement goal orientation and ASC with questions: a) Do students with performance-salient goals exhibit a stronger association with both upward and downward contrast emotions in ASC? b) Do students with mastery-salient goals engage more in upward assimilation emotions in ASC?

3. Methods

3.1. Participants

The sample comprised 397 South Korean high school students who attended two general high schools located in a metropolitan city. Tenth and eleventh grade students participated in this study. The ratios between females (50.1%) and males (49.6%) and between 10th graders (49.1%) and 11th (49.9%) graders were equitable. All students were of Korean ethnicity. The response rate was close to 90% with the collaborations of school administrators and teachers. The researchers obtained consent from the parents and students prior to the survey.

3.2. Measures

3.2.1. Academic achievement goals

The current study used the Academic Achievement Goal Orientation Scale for Adolescents (AAGOS), which was developed by Elliot et al. [42]. Korean version of AAGOS was validated by Lim[43]. The original 18 items were translated into Korean and Lim added six items to attain cultural validity. The current study used the task-approach and task-avoidance goals, and the other-approach and other-avoidance goals, which respectively correspond to mastery and performance goals. Participants were asked to rate the extent to which they agreed with each statement. The sample items included: "To get a lot of questions right on the exams in this class" (task-approach goal) and "To avoid doing worse than other students on the exams in this class." (other-avoidance goal). The response format was presented on a 7-point Likert scale, ranging from 1 = very much disagree to 7 = very much agree. Lim[43] reported adequate Cronbach's alphas, ranging from .78 to .87. The current study yielded the following Cronbach's alphas: .74 for task-approach, .77 for task-avoidance, .92 for other-approach, and .89 for other-avoidance. To maintain conceptual consistency with the prior literature, this study used the variable names of mastery and performance goals.

3.2.2. Academic social comparison emotions

The current study used the Scale for the Social Comparison-based Emotions with Academic Achievement (SSCEAA) developed by Chun[44]. This scale measures the emotions students experience when they engage in social comparison of academic matters. The scale consists of four subscales: upward assimilation, upward contrast, downward assimilation, and downward contrast of ASC emotions. Each subscale has three items with a total of 12 items. The sample items included: "Seeing my friends doing well makes me feel I can do well too" (upward assimilation emotion) and "I feel envious of my friend who achieved good results" (upward contrast emotion). The response format was presented on a 7-point Likert scale, ranging from 1 = not at all to 7 = always. Chun[44] reported adequate Cronbach's alphas of .75 for the total items, .69 for upward assimilation emotion, .82 for upward contrast emotion, .67 for downward assimilation, and .84 for downward contrast emotion. The developer reported the factor structure of the scale, which had four factors corresponding to the aforementioned subscales. Additionally, to test convergent validity, the relationships between SSCEAA and two relevant variables (i.e., ability-based social comparison and subjective wellbeing) were reported. It was reported that ability-based social comparison was positively correlated with upward contrast, downward

assimilation, and downward contrast of ASC emotions, while subjective wellbeing was negatively correlated with upward contrast and downward contrast of ASC emotions.

3.2.3. Self-esteem

To measure the degree of self-worth and respect perceived for oneself, this study used the self-esteem scale developed by Rosenberg[45] and adapted by Jeon[46] in the Korean context. It consists of 10 items with higher scores indicating higher self-esteem. Items were measured on a 5-point Likert scale, with responses ranging from "not at all" (1 point) to "very much so" (5 points). Rosenberg's self-esteem scale has been proven to be valid and reliable in multiple studies. In this study, the internal consistency of self-esteem items was Cronbach α of .88.

3.2.4. Grade

To measure academic grades, one item asked students about their overall grades in the previous term. They self-reported their grades with nine choices from the 1st to the 9th rank. Lower scores indicate higher achievement. The self-reports of the grades among participants were reported in the following order from the first to the last rank: 4.3%, 8.3%, 8.6%, 17.4%, 26.4%, 20.7%, 5.5%, 5%, and 2%. These percentages do not appear to be significantly deviated from the designated percentages for each rank, which are 4%, 7%, 12%, 17%, 20%, 17%, 12%, 7%, and 4%.

3.3. Procedure

Latent profile analysis was conducted using Mplus 8 as a statistical program. Latent profile analysis is a model-based analysis technique that tests multiple models with varying class numbers. The selection of the optimal model was guided by theoretical considerations and statistical indicators. Various statistical values are used in determining an optimal model in terms of the number of potential classes. Model fit was assessed through Bayesian Information Criterion (BIC), Sample-Adjusted BIC, and Akaike's Information Criterion (AIC), where lower values indicate better fit. Entropy, a measure of classification uncertainty, was used, with values above .80 indicating minimal uncertainty. Lo, Mendell, and Rubin (LMR) test and Bootstrap Likelihood Ratio (BLRT) test were employed for model comparison.

The determination of the number of latent classes considered both statistical indices and theoretical interpretability. After identifying the optimal model, significant differences in outcome variables (self-esteem and grades) across latent groups were examined. Considering the potential influence of outcome variables on latent group analysis, the BCH approach[47] was applied to address this concern, representing a recommended solution for incorporating distal outcomes in latent profile analysis[48]. While conducting this study, we adhered to all ethical standards recommended by professional academic associations. An IRB approval was obtained prior to the implementation of the study.

4. Results

This section may be divided by subheadings. It should provide a concise and precise description of the experimental results, their interpretation, as well as the experimental conclusions that can be drawn.

4.1. Preliminary analysis

Prior to the main analysis, errors in data entry and outliers were investigated. Descriptive statistics and zero-order correlations were conducted. Both the means and standard deviations were within the expected range, showing no excessive outliers. Examining the missing values, all missing values were within 1%, showing that the degree and pattern of missing values were not significant. The means and standard deviations

of the study variables, correlation coefficients between variables, and range of scales used are presented in **Table 1**. The correlation between variables appears in the expected direction.

Table 1. Descriptive statistics and Pearson correlations among the variables.

Variables	1	2	3	4	5	6	7	8	9	10
M-A	-									
M-V	.56**	-								
P-A	.18**	.38**	-							
P-V	.15**	.46**	.78**	-						
UA	.22**	.20**	.14**	.079	-					
UC	.00	.22**	.54**	.58**	-.02	-				
DA	.20**	.19**	.11*	.15**	.28**	.18**	-			
DC	-.02	.13**	.43**	.36**	.02	.44**	.19**	-		
GPA	-.28**	-.22**	-.25**	-.15**	-.25**	-.12*	-.19**	-.10*	-	
SE	.24**	.04	-.13*	-.16**	.34**	-.26**	.10*	-.08	-.24**	-
M	3.85	3.67	3.76	3.78	4.87	2.96	3.03	2.43	4.78	3.52
SD	0.92	1.03	1.31	1.26	1.15	1.40	1.36	1.13	1.78	0.57
R	1-6	1-6	1-6	1-6	1-7	1-7	1-7	1-7	1-9	1-5

Note. M-A: mastery-approach goals, M-V: mastery-avoidance goals, P-A: performance-approach goals, P-V: performance-avoidance goals, UA: upward assimilation emotions, UC: upward contrast emotions, DA: downward assimilation emotions, DC: downward contrast emotions, GPA: grade point average, and SE: self-esteem.

4.2. Model selection

The latent profile analysis was conducted by testing the model fit for each model starting from 2-class model to 7-class model. AIC, BIC, Sample-Adjusted BIC, entropy, significant tests of LMR and BLMR are presented in **Table 2**. Examining the information criterion indices, the numbers do not show a consistent pattern, which is a common phenomenon in latent profile analysis. As the number of groups increases, model fit values tend to be better[49].

In this study, as the number of potential classes increased, the LL, AIC, and SABIC values decreased. On the other hand, BIC showed the lowest value in the 6-class model. In terms of choosing the best fitting model, LMRT p value was statistically significant for the three- and six-class solutions, whereas the four-, five-, and seven-class were non-significant. Entropy values were above .80 for all models, showing good classification accuracy. Therefore, these statistical criteria suggested that the three-class and six-class models are the best fitting models. Additionally, we inspected and compared the three-class and six-class models in terms of the theoretical applicability and interpretability.

Table 2. Model fit indices for different class solution.

Model Fit	Class numbers					
Model fit	**2**	**3**	**4**	**5**	**6**	**7**
LL*	-4749.07	-4641.40	-4598.75	-4567.37	-4535.60	-4513.45
AIC	9548.14	9350.80	9283.50	9238.75	9193.19	9166.90
BIC	9647.74	9486.25	9454.80	9445.91	9436.21	9445.77
SABIC	9568.42	9378.37	9318.36	9280.92	9242.66	9223.66
LMRT	.000***	.000***	.50	.50	.026*	.48
BLRT	.000*	.000*	.000*	.000*	.000*	.000*
Entropy	0.849	0.838	0.833	0.842	0.834	0.841

Note. LL: Loglikelihood, *p < .05, ***, p<.001.

After evaluating the fit indices and considering theoretical relevance, we decided the six-class solution was the most optimal solution as it revealed distinct profiles with both quantitative and qualitative differences. When examining the shapes of the identified six classes (see **Figure 1**), the profiles of the first, third, and fourth classes exhibited similar shapes, but they differed in profile levels. Meanwhile, the second and sixth classes shared common aspects in their responses on achievement goal orientation and ASC emotions. The fifth class had a somewhat unique pattern compared to the other classes, with the profile elevated on mastery-approach goals and upward and downward assimilation emotions. Lastly, we provided the posterior probability average (see **Table 3**), which represents the probability that the selected model will accurately predict respondents classified in each class into that class. The posterior probability average ranged from .81 to .90, indicating acceptable classification quality. It has been suggested that a desirable criterion for the posterior probability mean is values above .90, and values between .80 and .90 are considered acceptable[50,51].

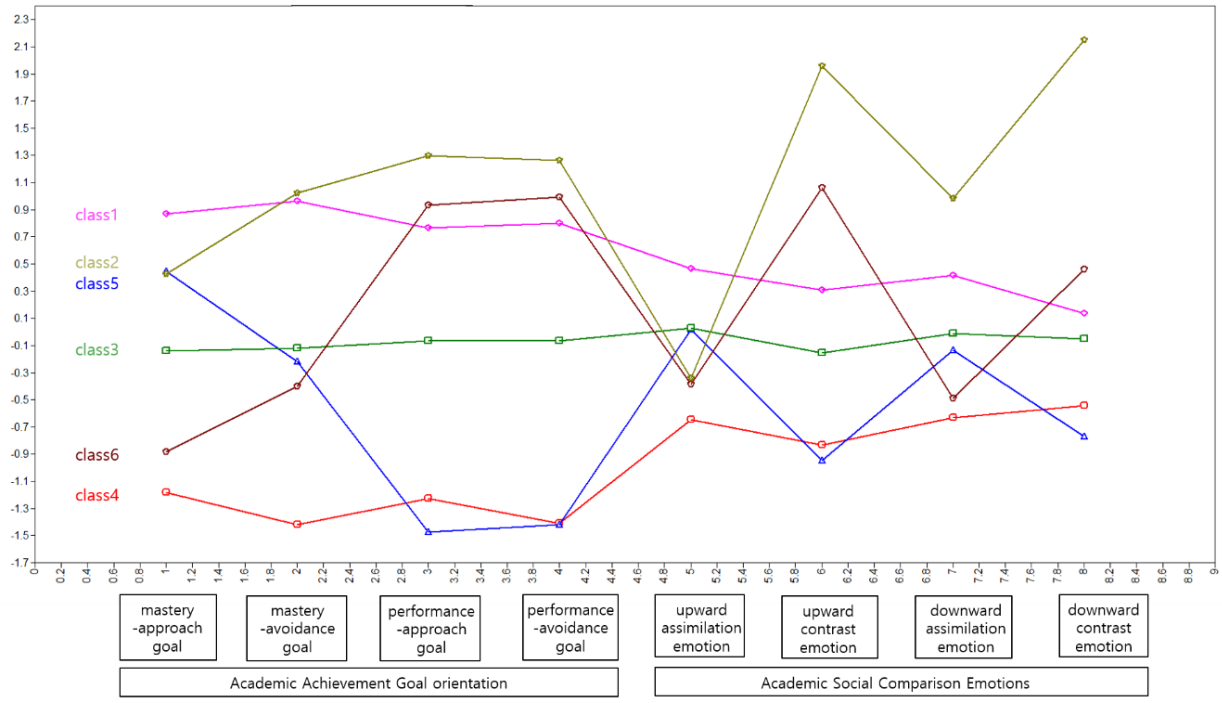

Figure 1. Latent profiles of the selected six-class model.

Table 3. Classification accuracy with class names.

Class Name	Profiles					
	1	2	3	4	5	6
1. High Multiple Goals & Stable ASC Emotions	0.00	0.00	0.03	0.07	0.89	0.01
2. Dominating Performance Goals & Intense Contrast Emotion	0.00	0.00	0.03	0.00	0.07	0.90
3. Moderate Multiple Goals & Stable ASC Emotions	0.01	0.02	0.02	0.90	0.05	0.00
4. Low Multiple Goals & Stable ASC Emotions	0.89	0.08	0.00	0.03	0.00	0.00
5. Mastery-approach Goals & Assimilation Emotions Connected	0.07	0.89	0.00	0.04	0.00	0.00
6. Performance Goals & Contrast Emotions Connected	0.00	0.00	0.81	0.09	0.09	0.02

4.3. Descriptions of the identified latent classes

Table 4 shows each class with means and standard deviations. The first class included 20.66% (n=84) of participants and was labelled as High Multiple Goals and Stable ASC Emotions. The profile of the first class had all achievement goals to be elevated with the mastery goals higher than performance goals. The second class was composed of 4.03% (n=16) of participants and was labelled as Dominating Multiple Goals and Intensive Contrast Emotions. The profile of the second class was characterized by high performance goals and highly elevated upward and downward contrast emotions. The third class involved 44.58% (n=175) of participants and was labelled as Moderate Multiple Goals and Stable ASC Emotions. The profile of the third class was manifested with average levels of all achievement goals and ASC emotions.

Regarding the description of the fourth class, it consisted of 9.07% (n=36) of participants and was labelled as Low Multiple Goals and Stable ASC Emotions. The profile of the fourth class was characterized with low levels of achievement goal orientation and ASC emotions. The fifth class was composed of 11.34 % (n = 45) of participants and was labelled as Mastery-approach Goals and Assimilation Emotions Connected. The profile of the fifth class showed relatively elevated both mastery-approach goals and two assimilation emotions. Lastly, the sixth class included 10.33% (n=41) of participants and was labelled as Performance Goals and Contrast Emotions Connected. The profile of the sixth class was characterized with high both performance-approach and performance-avoidance goals and elevated contrast emotions.

Table 4. Descriptions of the identified latent classes.

	1	2	3	4	5	6
	M (SE)	M (SE)	M (SE)	M (SE)	M (SE)	M (SE)
M-A	4.65 (0.14)	4.24 (0.12)	3.72 (0.09)	2.76 (0.23)	4.26 (0.15)	3.04 (0.26)
M-V	4.66 (0.12)	4.72 (0.18)	3.54 (0.09)	2.20 (0.16)	3.44 (0.22)	3.25 (0.28)
P-A	4.77 (0.13)	5.47 (0.14)	3.67 (0.11)	2.16 (0.23)	1.83 (0.14)	4.99 (0.21)
P-V	4.78 (0.13)	5.36 (0.16)	3.69 (0.11)	2.00 (0.20)	1.98 (0.16)	5.03 (0.15)
UA	5.40 (0.15)	4.47 (0.31)	4.89 (0.09)	4.12 (0.22)	4.88 (0.23)	4.42 (0.29)
UC	3.40 (0.26)	5.72 (0.32)	2.75 (0.09)	1.80 (0.18)	1.63 (0.12)	4.45 (0.43)
DA	3.59 (0.18)	4.37 (0.44)	3.01 (0.11)	2.16 (0.30)	2.85 (0.28)	2.36 (0.27)
DC	2.58 (0.13)	4.85 (0.49)	2.37 (0.08)	1.81 (0.18)	1.56 (0.11)	2.95 (0.32)
n	82	16	177	36	45	41
%	20.66	4.03	44.58	9.07	11.34	10.33

Note. M-A: mastery-approach goals, M-V: mastery-avoidance goals, P-A: performance-approach goals, P-V: performance-avoidance goals, UA: upward assimilation emotions, UC: upward contrast emotions, DA: downward assimilation emotions, DC: downward contrast emotions, GPA: grade point average, and SE: self-esteem.

1. High Multiple Goals & Stable ASC Emotions; 2. Dominating Performance Goals & Intense Contrast Emotions; 3. Moderate Multiple Goals & Stable ASC Emotions; 4. Low Multiple Goals & Stable ASC Emotions; 5. Mastery-approach Goals & Assimilation Emotions Connected; 6. Performance Goals & Contrast Emotions Connected

4.4. Identified profiles and outcome measures of self-esteem and grade

The differences in the outcome measures of self-esteem and grades across the identified six profiles were examined using the Chi-square test of independence and pairwise comparisons (see **Table 5**). Results indicated that profile membership had significant relationships with both self-esteem and grades. Regarding self-esteem, the fifth class (Mastery-Approach Goals & Assimilation Emotions Connected) scored higher than all other classes except for the first class. Additionally, the first class (High Multiple Goals and Stable ASC Emotions) scored higher than the second, third, and sixth classes. Moreover, the sixth class scored lower than the third and fourth classes. Concerning the self-reported grade, the first class (High Multiple Goals and Stable ASC Emotions) scored higher than the third, fourth, and fifth classes. Furthermore, the second class (Dominating Performance Goals and Intensive Contrast Emotions) scored higher than the fourth class. Lastly, the fourth class (Low Multiple Goals and Stable ASC Emotions) scored lower than the third and sixth classes.

Table 5. Differences across the six classes in outcomes: ANOVAs, and post hoc comparisons.

	Class Name	**GPA**		**Self-esteem**	
		M	**SD**	**M**	**SD**
1	High Multiple Goals & Stable ASC Emotions	4.10	0.21	3.7	0.1
2	Dominating Performance Goals & Intense Contrast Emotions	4.18	0.53	3.26	0.2
3	Moderate Multiple Goals & Stable ASC Emotions	4.85	0.14	3.48	0.1
4	Low Multiple Goals & Stable ASC Emotions	6.17	0.39	3.49	0.1
5	Mastery-approach Goals & Assimilation Emotions Connected	4.86	0.31	3.88	0.1
6	Performance Goals & Contrast Emotions Connected	4.79	0.31	3.08	0.1
	χ^2	26.00		42.77	
	Post Hoc	1>3, 4 & 5, 3, 6 >4,		5> 2, 3, & 4 1>2, 3, & 6 3 & 4 >6	

Note. ASC: academic social comparison emotions.

5. Discussion

To enhance our understanding of how high school students adapt to competitive learning environments, we examined their endorsement for achievement goal orientation and their engagement in ASC emotions using the latent profile analysis. By adopting a person-centered approach, we identified six distinct patterns of motivational and emotional experiences among high school students in the classroom context. We discuss interpretations of each profile, divergences from the literature, and lastly implications of the findings.

5.1. Interpretations

Among the six profiles identified, three profiles (first, third, fourth classes) had similar configurations but different profile levels: High Multiple Goals and Stable ASC Emotions, Moderate Multiple Goals and Stable ASC Emotions, Low Multiple Goals and Stable ASC Emotions. The second and sixth classes presented elevated performance goals and contrast emotions. The second class was named as Dominating Performance Goals and Intensive Contrast Emotions while the sixth class was named as Performance Goals and Contrast

Emotions Connected. Lastly, the fifth class exhibited a separate configuration, which was named Mastery-approach Goals and Assimilation Emotions Connected.

The first, third, and fourth classes exhibited similar configurations in both achievement goals and ASC emotions. Their endorsement was consistent across all four types of achievement goals with varying profile levels. Additionally, their engagement levels in ASC emotions corresponded to the profile levels on the achievement goals, implying that the amount of ASC emotions experienced stemmed from their endorsement of achievement goals. This finding aligns with Turner et al.'s[52] explanation, noting that stronger goals lead to greater emotional responses of satisfaction or distress. As academic achievement goals are rooted in interest in learning, it is interpreted that higher levels of achievement goals result in more strong experiences of ASC emotions. This finding supports our hypothesis that achievement goals and ASC emotions co-occur in systematic ways.

Comparing the first (High Multiple Goals and Stable ASC Emotions) and third (Moderate Multiple Goals and Stable ASC Emotions) classes, both had similar levels across four achievement goals and relatively even engagement in ASC emotions. The first class demonstrated high endorsement for all achievement goals and active engagement in all four types of ASC emotions to a somewhat elevated extent. It had the highest grade and the second highest self-esteem across the six classes, demonstrating optimal adjustment. This group of students are interpreted to have benefited from both mastery goals as well as performance goals. While they were able to keep internal interests and self-improvement in learning, simultaneously they engaged in comparing themselves with others. Regarding ASC emotions within the first class, their engagements did not significantly differ across the four types of ASC. This suggests that despite their openness to these emotions, no particular type dominates, implying minimal intrusion into their learning. This finding is different from the previous studies that emphasized most desirable outcomes with the high mastery-approach goals[21,30,53]. However, this finding aligns with multiple goal perspectives, claiming that performance goals can be adaptive when pursued alongside other goals[21,54].

The third class (Moderate Multiple Goals and Stable ASC Emotions), comprising 44.58% of students, endorsed all achievement goals at a moderate level along with stable engagement in ASC emotions. This class had moderate levels of self-esteem and grade. Several previous studies have reported similar profiles in which multiple goals are endorsed at a middle level and included a large proportion of the sampl[21,55]. Thus, the third class is one of the groups observed in previous studies.

The fourth class (Low Multiple Goals and State ASC Emotions) exhibited similar configurations to the first and third classes, but the profile level was the lowest. Although they had the lowest GPA among the six classes, this group displayed a moderate level of self-esteem. Furthermore, their engagements showed no significant involvement in negative emotions like upward or downward contrast emotions. Even though they have limited interest in academics, their moderate self-esteem and no significant engagement in negative emotions do not indicate maladjustment in their schooling. This class could be associated with what is often referred to as a "disengaged group." However, some previous studies have shown that they have a moderate level of self-esteem and low levels of depression, emotional exhaustion, and inadequacy[25,53]. It could be that as they are not highly engaged in learning, the toll on their self-esteem or emotional exhaustion is not pronounced. They might be oriented towards something other than academics.

The profiles of the second (Dominating Performance Goals and Intensive Contrast Emotions) and sixth (Performance Goals and Contrast Emotions Connected) classes significantly differ from the abovementioned classes, as they are characterized by elevated performance goals and heightened contrast emotions in ASC. The second class was highly engaged in both upward and downward contrast emotions in ASC. This suggests

that their attention is emotionally charged, directed both to those performing better and worse than themselves, resulting in a mix of negative emotions such as envy, depression, and resentment, as well as protective emotions like pride, relief, and schadenfreude. Despite the second-highest grade, the second class exhibited significantly lower self-esteem than the first and fifth classes. The sixth class was characterized with highly elevated performance goals but low mastery goals. They had the lowest self-esteem but achieved grades in the middle range across the six classes. This group of students are interpreted as having no benefit from mastery goals such as internal interest and joy of learning and is only concerned about comparison and competition. They are also interpreted as experiencing only negative emotions.

Through the second and sixth classes, the relationship between performance goals and contrasting emotions is confirmed. Individuals with the performance goals that focus on obtaining superiority over others and avoiding inferiority tend to believe that ability is fixed[3]. With this mindset, they may perceive themselves as unable to be similar to comparison targets, whether superior or inferior, thereby experiencing contrasting emotions. These students in the second and sixth classes seemed deeply immersed in competitive environments, facing significant threats to their self-esteem. We interpreted them as maladaptive groups due to their low self-esteem and highly elevated contrast emotions. They may have perceived their peers more as opponents in competition than as friends, colleagues, or mentors. It is possible that their emotions served as motivational resources for them to engage in constant comparison and competitions, which were self-regulating in negative ways. Similar profiles in previous studies have been reported as resulting in high levels of academic stress, depression, and emotional exhaustion[20,53].

The fifth class (Mastery-Approach Goals and Assimilation Emotions Connected) stood out as unique in this study. This class exhibited a relatively high mastery-approach goal along with the lowest performance goals across the six classes. Their low engagement in contrast emotions may be attributed to the combination of high mastery-approach goals and low performance goals. Focused on internal learning processes and skill improvement, these students are less concerned about comparing themselves with others. Their emotional experiences are mainly characterized by upward assimilation emotions such as hope, aspiration, and admiration. Additionally, the fifth class displayed significantly higher self-esteem compared to other classes, except for the first class. The configuration of the fifth class is not uncommon in the literature and is often referred to as high mastery-approach goals. This profile is associated with positive learning outcomes, including interest, enjoyment, learning strategies, engagement, and self-esteem[20,21,26,53].

5.2. Differences of the current findings compared to previous studies

Comparing the six identified classes to previous studies, several differences are worth mentioning. Most of all, in this study the most optimal profile was found to be the first class (High Multiple Goals and Stable ASC Emotions). This differs from previous studies emphasizing high mastery-approach goals for desirable outcomes[21,53]. However, this finding aligns with the multiple goal perspective, suggesting that pursuing both mastery and performance goals are more beneficial than pursing mastery-approach goals only[22]. However, it is important to note two additional features of the first class. First, their endorsement for mastery-approach goals was slightly higher than their endorsement for performance goals. Secondly, even though their high endorsement for performance goals, their emotional experiences were stable with slightly more acknowledging assimilation than contrast emotions. Integrating these features, the first class maintained optimal adjustment by upholding both high mastery and performance goals with stable emotional experiences.

This study resulted in another difference compared to the previous studies. The first and second classes could have been grouped together in other studies as a success-oriented class. However, this study differentiated these two classes. Although both groups of students highly endorsed all achievement goals, their

emotional experiences significantly differed. One possible explanation for this difference is their varying endorsement of mastery goals and performance goals, with the first class showing more inclination towards mastery goals and the second class towards performance goals. This discrepancy likely contributed to their engagement in upward assimilation emotions. The first class appeared to benefit from positive emotions such as hope, aspiration, and admiration, while the second class exhibited low engagement in these emotions. Conversely, the second class experienced envy, anger, and depression when comparing themselves to superior peers. When observing inferior peers, they felt both pride and relief, along with anxiety about becoming like them and feeling sorry for them — forming complex emotions. This study demonstrated that even though both classes shared the feature of multiple goals, students' perceptions of comparison differences with others can direct them toward healthy or unhealthy learning paths.

Lastly, it is notable that the levels of the endorsement of both performance-approach and performance-avoidance goals were consistent across the six classes. In other words, when students experience performance-approach goals, they also tend to simultaneously experience performance-avoidance goals. This feature differs from previous studies where two goals functioned independently[20,27]. It could be interpreted that, with the inclusion of ASC emotions in the analysis, the profile features became more refined based on their engagement patterns in comparison with others. Thus, the endorsement for both performance goals, involving social comparison, consistently co-occurred. Another possibility is that, when students are concerned about outperforming others, they also encounter situations where they fall short. Given the importance of relative standing under the relative grading system in South Korea, students might naturally worry about losing. Thus, experiencing both performance goals as a set might be consequential. Some researchers raised this as one potential issue for multiple goal pursuers[21,56]. This study evidenced that under a competitive learning environment performance-approach and performance-avoidance are interdependent. The benefits of performance-approach goals could be offset by the influence of performance-avoidance goals.

5.3. Implications

This study provides several insights into students' patterns of achievement goal orientation and ASC emotions. A majority of students in this study showed that their endorsement of mastery goals was comparable for their endorsement of performance goals. This similarity could be a sign of positive adjustment, suggesting that in a competitive environment, students maintained their orientation towards mastery-approach goals. This finding supports the notion that even for those with multiple goals profiles it is crucial to uphold mastery-approach goals and foster positive ASC emotions. In challenging and competitive learning environments, students who are able to focus on their internal learning processes and maintain upward assimilation emotions, demonstrate positive outcomes in academics as well as emotional wellbeing. It might be helpful to guide students in the direction for positive and healthy comparisons rather than encouraging them to avoid comparisons, especially considering the inevitability of comparisons within the relative evaluation system.

This study shows that upward and downward contrast emotions were associated with low self-esteem. This finding implies the mechanisms underlying the relationship between achievement goal orientation and self-esteem. In other words, the social comparisons experienced during the learning processes might be proximal predictors to students' self-esteem. When they do not perceive a sense of control over the difference between someone superior and themselves, negative social comparison emotions emerge, and their self-esteem becomes low.

Another feature of ASC emotions is the simultaneous occurrence of upward and downward contrast emotions in students. It implies that they focus on differences rather than commonalities with others. The underlying mechanisms can be explained by Mussweiler's[32] selective accessibility model. According to this

model, individuals have two options when comparing themselves to others: similarity hypothesis testing and dissimilarity hypothesis testing. After making a holistic assessment of the comparison target, they engage in either similarity or dissimilarity hypothesis testing. Similarity hypothesis testing leads to assimilation comparisons while dissimilarity hypothesis testing leads to contrast comparisons. Thus, students who endorse performance goals over mastery goals are more likely to engage in dissimilarity hypothesis testing, resulting in elevated upward and downward contrast emotions. Future study might explore the underlying informational processes of achievement goals and ASC emotions.

In addition, for those with both contrast emotions elevated, this may indicate negative adjustments in their relationships, particularly given the importance of peer relationships during adolescence. Friends can provide crucial social support while adolescents navigate their relationships with parents and explore their identities in adolescence. Once they focus on differences with others, the quality and range of their relationships might be limited and narrowed, which could hinder friendship development. A qualitative study on psychological experiences in South Korea's relative grading system[1] revealed that high school students had conflicting feelings about their peers, perceiving them as both friends and competitors. Although the second (4%) and sixth (10.3%) classes in this study constitute a small percentage of the entire sample, they may face adjustment issues, including negative self-images, feelings of helplessness, and challenges in psychological well-being and social skill development.

To help with students who face these issues, teachers, parents, and psychologists should be attentive to potential challenges students may encounter in competitive learning environments. Interventions may be necessary to mitigate their intense involvement in comparison and competition. Additionally, raising awareness of how competitive environments influence their learning processes concerning engagement in comparison and competition could be beneficial.

This study has several limitations. First, most of the variables were assessed using self-report measures. The reliance on self-report grades might not perfectly reflect actual academic performance, although reported percentages align closely with predefined grade rank percentages. Second, the study was conducted in a competitive learning context, limiting generalizability to settings where cooperation is more emphasized. Third, the ASC emotions scale is relatively new, lacking extensive validation data. Nevertheless, this study establishes satisfactory relationships between these emotions and related variables, providing some evidence of validity. Lastly, the sample size of the second class, "Dominating Performance Goals and Intensive Contrast Emotions," is relatively small (4.0%, n=16). Despite its unique profile, a larger sample size would enhance the ability to detect smaller effects more reliably.

In conclusion, this study makes a valuable contribution to the literature by examining achievement goal orientation and ASC emotions concurrently. The unique six classes identified in this study are believed to represent distinct patterns of adjustment based on their levels of endorsement for achievement goal orientation and their engagement in ASC emotions. Furthermore, the observed variations in academic grades and self-esteem across these six classes provide additional support for the validity of the identified classifications.

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Conflict of interest

The authors declare no conflict of interest.

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