Unmasking Student Dynamics: the Impact of COVID-19 on Social-Emotional Development and Learning Engagement[1]

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Abstract: This study aimed to examine the impact of COVID-19 on the pattern of social-emotional development and learning engagement of Korean students. It employs latent profile analysis to categorize middle and high school students based on their social-emotional development (action-orientation, optimism, perseverance, relationship with adults) and learning engagement (cooperative learning, and self-directed learning). The analysis, conducted during the fall semester of 2019 and the spring semester of 2020 amid COVID-19 school closures, explores nuanced patterns and effects. The findings reveal distinct student groups with discernible differences across all factors both before and during school closure. Notably, the research suggests that early social-emotional development may influence subsequent developmental stages and that a student's social-emotional skills correlate with cooperative and self-directed learning. Furthermore, the study highlights the pandemic's varied impact on student groups, indicating that those with advanced social-emotional competencies and established learning practices were resilient to school closures. In contrast, 'average' students faced challenges in cooperative and active learning during lockdown. The study underscores the need for targeted educational measures, particularly for at-risk students, and suggests proactive preparation for future pandemics.

Keywords: COVID-19, Social-emotional development, Learning engagement, LPA

Introduction

In the dynamic landscape of education, children's growth and development are intricately woven into their interactions with diverse social agents, encompassing teachers, peers, and family members (Dewey, 1938). The quality and nature of these intellectual exchanges, whether within the structured confines of the educational institution or in the broader societal context, wield considerable influence over students' academic achievements and socio-emotional development. In this context, public schools actively foster diverse interactions to mitigate dropouts and enhance learning outcomes, employing strategies like learning community activities, cooperative learning, mentoring programs, and extracurricular pursuits. Notably, enriched engagements with parents and siblings at home also play a pivotal role in shaping the trajectory of a child's growth.

The landscape of education, however, underwent a seismic shift with the advent of the COVID-19 pandemic, which profoundly affected students' classroom activities and daily

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lives in the Korean context over the 2019-2020 period. The imposition of lockdowns, a consequence of social distancing policies, forced most Korean schools to close their doors, compelling students into a realm of online remote learning. This isolated them from the conventional school environment, disrupting the accustomed academic and social interactions. In this unprecedented context, it is reasonable to hypothesize that the dynamics of interpersonal interactions, whether for learning, socializing, or recreational activities, underwent significant transformations. Students may have experienced a sense of disconnection, lacking the stimuli and experiences essential for their holistic growth and development. More importantly, the lockdown might have engendered a discriminatory impact, with variations in the socioeconomic status of parents, family's social and cultural capital, and engagement in social network services (SNS) potentially differentially affecting students and, consequently, influencing their learning and social-emotional development.

The purpose of this study is to categorize students based on the degree and pattern of their social-emotional development and learning engagement. It particularly seeks to unravel the changes between two distinct periods—the fall semester of 2019, preceding the COVID-19 outbreak, and the spring semester of 2020, marked by school closures and restricted academic and social interactions. The observed variables for social-emotional development encompass activity orientation, perseverance, optimism, and relationships with adults. Concurrently, students' learning engagement patterns are examined through the lenses of cooperative learning and self-directed learning.

The onset of the pandemic precipitated alterations in the landscape of academic activities, ushering in new teaching-learning paradigms (Bae & Hwang, 2020). As schools transitioned to remote learning, students found themselves navigating predominantly pre-recorded and real-time interactive classes, markedly distinct from traditional face-to-face instruction (Bae & Cho, 2021). The learning environment, mediated by learning management systems, witnessed a shift in the modality of class management, student discussions, and teacher-student interactions. Extended education including extracurricular activities, sports, and leisure activities dwindled, limiting socio-emotional exchanges among students. Furthermore, exposure to negative news and the prolonged isolation imposed by the lockdown heightened the risk of psychological distress among students, accentuating the impact on their social and emotional development.

The significance of the study lies in its nuanced exploration of how students' socio-emotional development and learning experiences evolve amidst a lockdown situation and an online-based remote learning environment. As the specter of future pandemics looms, understanding the repercussions of COVID-19 on students becomes imperative to preemptively devise educational measures. This study not only sheds light on the adaptive strategies employed by students in online learning environments but also identifies groups that may require tailored educational support amidst the challenges posed by social distancing and school closures. In offering academic and practical implications, this study equips educational authorities with insights to navigate the unpredictable terrain of future crises, safeguarding students' growth, and fortifying the quality of education. The results of the study will contribute to providing information that can be used for educators and policymakers to identify students who need special educational measurements and develop tailored educational practices and policies in a pandemic situation that may come again in the future.

Review of the related literature

Social-emotional development

The swift progression of social-emotional development (SED) in the lives of children and youth is a pivotal aspect that can intricately shape their future trajectories. Recognizing the profound impact of this development, especially in the context of subsequent life outcomes, underscores the paramount importance of understanding and fostering the social and emotional growth of the youth.

Developmental perspectives necessitate an appreciation for the critical windows of time during which children and youth are particularly responsive to essential skills, including collaboration, self-regulation, and perseverance. This developmental process extends beyond the confines of traditional school-based curricula. It involves a holistic approach, seamlessly integrating social-emotional learning with developmentally appropriate timing to facilitate optimal youth thriving. In the scholarly domain, these social and emotional developmental experiences are often referred to as psychosocial areas, encapsulating changes in emotion, personality, identity, and interpersonal relationships (Seifert, Hoffnung, & Hoffnung, 2000).

Understanding the dimensions of each young student's social-emotional development (SED) becomes a crucial imperative for educators. This understanding enables educators to discern the evolving needs and strengths of young learners, offering insights into how these facets change over time. As a testament to the increasing recognition of the significance of SED, the PEAR Institute at Harvard University introduced the Clover Model. This model serves as a comprehensive framework elucidating the intricate interplay of physical, cognitive, and social development in shaping how young individuals learn, think, and form connections with their peers. The Clover Model stands on a solid foundation of research, emphasizing four indispensable elements—Active Engagement, Assertiveness, Belonging, and Reflection—that are integral to thriving across various stages of human development (Malti & Noam, 2009).

- Active Engagement: Active Engagement, at its core, is the innate desire to actively and physically connect with the world using one's body. This inclination is particularly pronounced in early childhood, where the specialized focus on active engagement and physical activity commences at birth and persists until approximately age 5.
- Assertiveness: The dimension of Assertiveness signifies the development of self-efficacy, the capacity to express one's inner voice. This facet gains prominence during the formative years of middle school, spanning from age 6 to 10. It underscores the significance of providing young individuals with opportunities to make decisions independently, fostering dominance and autonomy in their relationships.
- Belonging: Belonging, an essential component, denotes the child's yearning to establish connections with peers and adults in their immediate surroundings. This desire for group acceptance and identity is particularly pivotal in early adolescence, ranging from age 11 to 16.
- Reflection: Reflection, in the context of social-emotional development, represents the inclination for self-reflection and identity exploration. This dimension involves making sense of one's own identity, experiences, emotions, and thoughts. Late adolescence, from age 16 and beyond, becomes the specialized phase for Reflection, where youth actively

strive to find meaningful insights inwardly, enhancing their ability for self-awareness and gaining profound insights.

Empirical evidence indicates that developmentally sensitive assessments play a critical role in enhancing the efficacy of intervention strategies tailored to meet the developmental needs of children and youth (Malti, Chaparro, Zuffianò, & Colasante, 2016; Weisz, 1997). In line with this, the PEAR Institute developed the Holistic Student Assessment (HSA). The HSA, theoretically grounded in the Clover Model, serves as a quantitative self-report survey measuring the social-emotional developmental status of learners from kindergarten to adulthood. The assessment focuses on four critical dimensions: Action orientation, Optimism, Perseverance, and Relationship with others. The HSA, rigorously researched by Noam and Goldstein (1998) and Song (2003), strategically aligns with the four leaves of the Clover Model, measuring resiliencies essential for holistic developmental assessment. This multidimensional approach contributes significantly to advancing our understanding of social-emotional development, providing educators and researchers with a comprehensive toolkit for nuanced interventions tailored to diverse developmental needs.

Table 1. HSA Subscales as Applied to The Clover Model

Clover Model	HAS Subscales	Definition	Sample Item
Active Engagement	Action Orientation	Engagement in physical and hands-on activities	I like being physically active and moving my body.
Assertiveness	Perseverance	Confidence in putting oneself forward and standing up for what one believes	I defend myself against unfair rules.
Belonging	Relationship with Adults	Good relationship with adults	When I have a problem, I talk to the adults.
Reflection	Optimism	Enthusiasm for and hopefulness about one's life	I have more good times than bad times.

Learning engagement

The pivotal role of learning engagement in the educational landscape has been examined by seminal scholars such as Csikszentmihalyi (1992) and Deci and Ryan (1985). Engagement, as conceptualized by Csikszentmihalyi, goes beyond mere participation; it serves as a catalyst for interest and active involvement in learning. The impact of engagement extends far beyond the educational realm, permeating into various facets of life, fostering creativity, enjoyment, advanced learning experiences, skill development, and heightened self-esteem.

Deci and Ryan (1985) augment this perspective by revealing that internal motivation in learning not only enhances learning ability but also contributes to the experience of positive emotions and increased confidence. Consequently, the characteristics of engagement become crucial determinants of the quality of the learning experience. When students actively engage

in a learning situation, they not only derive enjoyment but are also more likely to exhibit curiosity and a desire to learn, thereby positively influencing academic achievement (Csikszentmihalyi et al., 1993).

In essence, learning engagement emerges as a linchpin connecting to the realms of self-directed learning and cooperative learning. The enjoyment and active participation associated with engagement lay the foundation for a dynamic and interactive learning environment.

- Cooperative Learning: Cooperative learning, as elucidated by Cabrera et al. (2002), stands as a strategic teaching method that transcends individual learning activities. It involves the sharing and interaction of learners' authority and responsibility for learning, typically manifested through peer response groups and peer tutoring. At its core, cooperative learning is not confined to the acquisition of individual knowledge; rather, it revolves around the dynamic interaction between learners. Within the context of cooperative learning, knowledge exchange among peers is not merely a means to achieve common goals but fosters the development of a peer culture and policies within a social context. This, in turn, exerts a profound influence on learners' perceptions and behaviors. The impact of cooperative learning extends beyond the immediate learning outcomes, significantly improving learners' teaching and school satisfaction (Resta & Laferrière, 2007; Swan, 2001), fostering higher-order thinking skills and academic achievement (Resta & Laferrière, 2007), and cultivating positive relationships among learners (Roseth, Johnson, & Johnson, 2008).
- Self-directed Learning: Self-directed learning, as delineated by Ellinger (2004), marks a series of learning processes where learners actively participate in shaping their educational activities. Autonomous learners, as emphasized by Loyens, Magda, and Rikers (2008) and Macaskill & Denovan (2013), play a pivotal role in this process. They take charge of diagnosing their learning needs, setting goals, identifying resources, selecting appropriate learning strategies, and evaluating outcomes. Beyond the mechanics of learning, self-directed learners embody a sense of responsibility for their educational journey. They make decisions independently, exercise emotional control, and harbor intrinsic motivation for learning. The autonomy and motivation associated with self-directed learning contribute to a proactive and empowered approach to education.

In the nuanced landscape of educational research, learning engagement, cooperative learning, and self-directed learning emerge as interconnected dimensions, shaping the multifaceted experiences of learners. Understanding and harnessing these dimensions not only enhance the educational journey but also pave the way for innovative pedagogical strategies and interventions.

Impact of COVID 19 on education and student development

The global landscape of education witnessed an unprecedented upheaval due to the advent of the COVID-19 pandemic, prompting an urgent need to scrutinize student patterns of socio-emotional development and learning engagement. This study delves into the nuanced changes brought about by school closures before and after the onset of COVID 19, with a primary focus on understanding alterations in the educational environment.

Changes in teaching and learning

The seismic shift induced by COVID-19 in the educational domain, as noted by Baber (2021), propelled the world into uncharted territories. Offline activities dwindled, giving way to the prominence of online-based teaching and learning under the constraints of social distancing (Cuaton, 2020; Griffiths, 2020; Moawad, 2020; Zhang, Wang, Yang, & Wang, 2020). Concerns over diminishing academic achievement took center stage in various studies. In the U.S., the repercussions of face-to-face class losses were anticipated to disproportionately affect math and reading subjects, with a pronounced impact on lower grades and pre-existing low-achieving students (Soland et al., 2020).

Contrary voices labeled this period as a digital revolution in teaching and learning experiences (Tiwari, S′eraphin, & Chowdhary, 2021), ushering in a potential paradigm shift towards routine distance learning (Griffiths, 2020). In the Korean context, where online learning in public education was limited, the pandemic served as a catalyst for the practical implementation of online education, turning what was once considered a future prospect into a current reality (Gillis & Krull, 2020).

However, it is crucial to note that online learning during the pandemic primarily manifested as Emergency Remote Teaching (ERT), lacking the depth of a fully transitioned online learning experience (Hodges et al., 2020). Despite instances of commendable remote teaching, the unpreparedness induced by the sudden pandemic hindered efforts to enhance the quality of classes, leading to widespread student dissatisfaction.

This period of online learning accentuated educational disparities, with studies showcasing exacerbated learning gaps linked to socioeconomic backgrounds. Students from lower socioeconomic strata faced more challenges in online learning, highlighting disparities in access to digital devices and related content (Lee et al., 2020). Additionally, variations in parental support and guidance further accentuated differences in students' experiences of self-directed learning and supplementary educational support (Choi, 2022).

In essence, the pandemic reshaped the landscape of Korean education, thrusting all teaching and learning activities into the online realm and unveiling challenges related to unpreparedness and socioeconomic differentials. Amidst these changes, this study assumes a distinctive stance by investigating how active learning participation has evolved during the pandemic.

Impact on student development

The impact of COVID-19 extends beyond cognitive dimensions, permeating the social and emotional fabric of education. A monumental transformation unfolded as schools transitioned to non-face-to-face modalities, particularly in Korea, where traditional classrooms gave way to virtual meetings between teachers and students via monitor screens.

While society at large witnessed new lifestyles such as increased time due to the prevalence of working from home and strengthened social capital through digital media, learners experienced a starkly different reality. For students, according to Durkheim's theory, school is not merely a knowledge acquisition space but a crucial arena for socialization. The non-face-to-face situation during the pandemic heightened anxiety, depression, and academic stress among students (Ministry of Education, 2022). Most notably, friendships suffered in this

altered educational landscape, necessitating attention to the emotional difficulties arising during a critical period of children and adolescents' development.

COVID-19, by its nature, curtailed social contact, subjecting children to heightened stress due to reduced social activities. Concurrently, parents' stress and anxiety compounded these challenges (Elmer, Mepham, & Stadtfeld, 2020). The prolonged pandemic-induced isolation exacerbated depression and anxiety among children, disrupting the psychological stability derived from forming social relationships within the school space (Choi, 2020).

Childhood and adolescence constitute a pivotal phase for social and emotional development, where students cultivate skills to recognize and manage emotions, act ethically and responsibly, and foster positive relationships (Zins et al., 2004). Therefore, this study assumes academic significance by delving into the evolving patterns of students' social-emotional development amid the pandemic, shedding light on the intricate interplay between education and the transformative forces of COVID-19.

Methods

Data

This study aims to categorize Korean middle and high school students into distinct groups based on their levels and patterns of social-emotional development and learning engagement. The data were collected through a comprehensive survey administered before and during the school closure, specifically during the fall semester of 2019 and the spring semester of 2020. The objective is to discern the disparities in patterns and aspects between two temporal models: Before School Closure and During School Closure.

The present study draws upon empirical data obtained from a rigorously constructed survey instrument developed in collaboration between Harvard University's PEAR Institute (Noam & Goldstein, 1998) and Sungkyunkwan University's Institute for the Future of Education. Executed during the period from July 1 to July 31, 2020, the survey was administered online, targeting students in five middle schools and five high schools.

To ensure the integrity of the dataset, meticulous procedures were employed in the screening process, resulting in the inclusion of 2,006 middle school students and 1,246 high school students after the exclusion of insincere responses[2]. For a comprehensive depiction of the demographic characteristics of the sample, refer to Table 1, which provides a detailed overview of the study participants.

2 Although there are clear differences between middle and high schools, this study aggregated data considering the optimal sample size to increase the reliability of latent class group classification.

Table 2. Sample Description

Grade		Girl		Boy		Total
		n	%	*n*	%	
Middle School	7	382	52.70%	343	47.30%	725
	8	544	58.70%	382	41.30%	926
	9	180	50.70%	175	49.30%	355
High School	10	320	53.20%	282	46.80%	602
	11	285	61.60%	178	38.40%	463
	12	102	56.40%	79	43.60%	181
Total		1,813	55.80%	1439	44.20%	3,252

Variables and Measurement

Social-emotional development was measured using a measurement tool developed by the PEAR Institute of Harvard University, comprising four key factors: action orientation, optimism, perseverance, and relationship with adults. Learning engagement was assessed through two factors—cooperative learning and self-directed learning. The selection of these factors stems from the hypothesis that, amid distant learning and stringent social distancing due to school closure and the COVID-19 pandemic, students may face challenges in participating in cooperative learning, thus emphasizing the significance of self-directed learning in a remote home-based learning context. Table 3 delineates the items associated with each factor, with responses measured on a 5-point Likert scale, ranging from 1 to 4 (not at all=1, sometimes=2, often=3, almost always=4).

Table 3. Factors, items, and reliabilities

Factor	Item	Reliability	
		Before	During
Action orientation	I like to move my body I like being active Exercise is important to me	0.721	0.751
Optimism	Even if I am having a bad time, I am able to see good things in my life I have more good times than bad times More good things than bad things will happen to me	0.695	0.764
Perseverance	I work hard to achieve goals even if things get in the way I keep going with work even if it takes longer than I thought it would When I try to accomplish something, I achieve it	0.674	0.745
Relationship with Adults	I talk with adults if I have problems There is at least one adult I can talk to about my problems Adults are interested in what I have to say	0.554	0.604
Cooperative Learning	I have opportunities to work in groups I get feedback on my ideas from classmates I help explain schoolwork to my classmates I work with classmates on school projects outside of class	0.74	0.745
Self-directed Learning	I know what I need to learn I actively set my learning goals I set aside enough time for studying I know how to study effectively I use study strategies to reach my learning goals	0.771	0.782

Analytic Strategies: Latent Profile Analysis (LPA)

Data analysis was conducted using latent profile analysis (LPA), a mixed model categorizing observed individual data into unobserved groups. LPA operates under the assumption that latent groups possess distinct probability distributions and are mutually exclusive (Terry et al., 2006). The study employed a robust maximum likelihood (MLR) estimator to address non-normality concerns, offering robust standard error and x 2 test statistics, particularly resilient against outliers (Wang & Wang, 2012).

Model fit was rigorously assessed using a range of indices, including Akaike Information Criteria (AIC), Bayesian Information Criterion (BIC), Sample Sizing BIC (saBIC), Vuong-Lo-Mendell-Rubin Likelihood Ratio Test (LMR), Bootstrap Likelihood Ratio Test (BLRT), and entropy. AIC, BIC, and saBIC values guided the identification of the optimal model, with lower values indicating superior fit. LMR and BLRT compared k and k-1 class models based on likelihood differences, with a p-value less than .05 signifying the superiority of the k-class model. Entropy, ranging from 0 to 1, gauged the precision of class membership classification, with higher values indicating more accurate classification. The study considered class size,

aiming for each class to encompass at least 1% or 25 cases of the sample for optimal statistical power (Tein et al., 2013). Mplus 8.0 was the statistical software utilized for the aforementioned analyses.

Findings

Results of the Before School Closure

Data Fit for the Models

In employing latent profile analysis to uncover latent classes within the student population, the study assessed the model fit using various indices. As shown in Table 3, the lower AIC, BIC, and saBIC values, coupled with higher entropy, pointed to the superiority of the eight-class model. Additionally, the BLRT test robustly affirmed the appropriateness of this model.

Table 4. Data Fit for the Models of Before School Closure

Models	AIC	BIC	saBIC	LMR	BLRT	entropy
2	39270.92	39387.79	39327.42	0.00	0.00	0.78
3	38038.37	38198.30	38115.68	0.00	0.00	0.76
4	37675.20	37878.18	37773.33	0.00	0.00	0.73
5	37550.72	37796.76	37669.66	0.10	0.00	0.75
6	37340.94	37630.03	37480.69	0.03	0.00	0.71
7	37227.37	37559.52	37387.94	0.28	0.00	0.71
8	37184.78	37560.00	37366.17	0.18	0.00	0.76
9	37065.62	37483.89	37267.82	0.22	0.00	0.75

Note. LMR = Vuong-Lo-Mendell-Rubin likelihood-ratio test; BLRT = bootstrap likelihood ratio test.

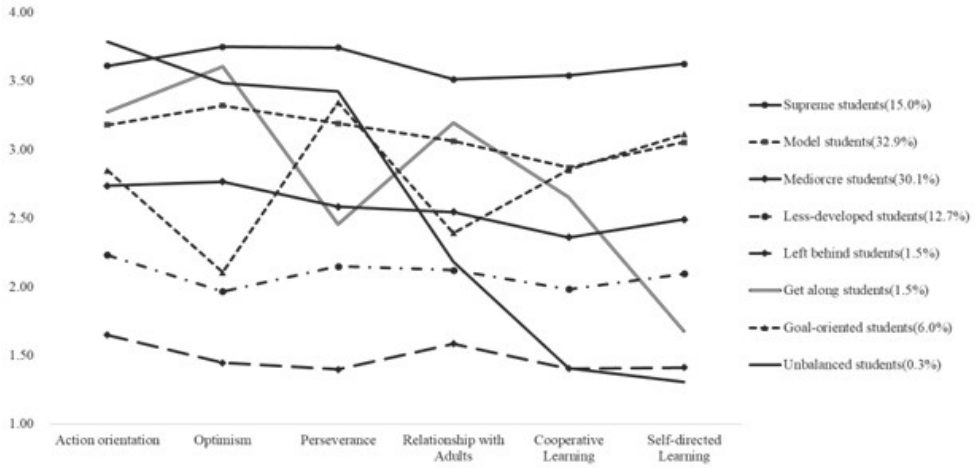
Name and features of each latent class

Figure 1 encapsulates the outcome of latent class analysis, revealing eight distinctive student groups based on their social-emotional development and learning engagement during the fall semester of 2019. A detailed breakdown of factor levels by group is provided in Table 5.

- Supreme Students (15.0%): This group, comprising the highest achievers, exhibited the pinnacle levels in both social-emotional development and learning engagement factors. Notably, these students showcased exceptional action orientation, optimism, perseverance, and strong relationships with adults.
- Model Students (32.9%): While not reaching the absolute zenith, this group demonstrated consistently high levels (3.0 or higher) across observed factors, excluding 'cooperative learning.' Their well-roundedness is evident, contributing to the largest portion of the sampled population.
- Mediocre Students (30.1%): Representing a significant portion of the sample, this group displayed moderate levels across all factors, signaling a balanced but average profile in terms of social-emotional development and learning engagement.

- Less Developed Students (12.7%): This cohort exhibited levels around 2.0, indicating 'sometime' on the scale, across all six factors. Their profile suggests a need for targeted interventions to bolster social-emotional development and learning engagement.
- Left-Behind Students (1.5%): A vulnerable group with lower levels across all social-emotional development and learning engagement factors, this cohort may be characterized as 'at-risk students.' Their profile necessitates focused attention and support.
- Get-Along Students (1.5%): Characterized by positive attitudes, physical activities, and active interaction with adults, this group displayed strengths in certain areas but exhibited lower levels of 'persistence' and 'self-directed learning.' Their unique profile suggests a need for a nuanced approach to foster holistic development.
- Goal-Oriented Students (6.0%): This group demonstrated high levels of 'perseverance' and 'self-directed learning' but lacked positive attitudes toward life and relationships with adults. Their distinct profile may indicate a focused determination to achieve academic goals.
- Unbalanced Students[3] (0.3%): With positive attitudes and physical activity, this group displayed an immature relationship with adults and low engagement in learning. Their profile suggests a need for interventions that align their enthusiasm with academic pursuits and interpersonal relationships.

Figure 1. Latent Classes of the Before School Closure Model



The outcomes of the current study unveil a predominant distribution, accounting for 92.2% of the total sample, across the first to fifth latent groups—specifically, the supreme, model, mediocre, less-developed, and left-behind student groups. An observably salient facet is the discerned variability in levels across these groups, juxtaposed with a consistent manifestation of socio-emotional development factors at commensurate levels within each group. Specifi-

3 This group shows the lowest distribution. However, it was included in the research results because it provides information showing the aspect about the impact of COVID 10 on students' socio-emotional development and learning engagement.

cally, an elevated level of the primary factor, action orientation, relates with similarly heightened levels in the ancillary factors—namely, perseverance, relationships with adults, and optimism—within these groups. Conversely, diminished levels in the primary factor align with a corresponding attenuation in the latter three factors.

This study embraces the Clover model, a developmental paradigm put forth by the PEAR Institute. This model serves as a Developmental Process Theory of social-emotional development, elucidating the evolution of emotional, interpersonal, and resiliency skills vital for success and thriving across the lifespan—from infancy through adulthood (Noam & Triggs, 2018). It maps a sequential trajectory in students' socio-emotional development, progressing from behavioral orientation to the establishment of relationships with adults. Significantly, the failure to attain requisite development in the early stages emerges as a potential hurdle, exerting adverse effects on subsequent developmental phases. In the context of our study's findings derived from a sample of Korean students, there is indirect support for the PEAR Institute's model, originally conceptualized within the framework of North American youth development.

Another noteworthy finding emerges from the observed association between a student's social-emotional development level and their predisposition towards cooperative learning and self-directed learning. The study results show that heightened levels of social-emotional development align positively with augmented proclivities towards cooperative and self-directed learning within each latent group. Conversely, lower levels of social-emotional development are associated with a concomitant attenuation in these educational factors. While the present study refrains from advancing causal inferences, these findings imply that the potential nexus may exist between students' socio-emotional development and their orientation towards cooperative and self-directed learning.

Table 5. Levels of each Factor by Group

	action orientation	optimism	perseverance	Relationship with Adults	Cooperative Learning	Self-directed Learning	n	%
Supreme students	3.61	3.75	3.74	3.51	3.54	3.63	520	15.0%
Model students	3.18	3.32	3.19	3.06	2.87	3.05	1140	32.9%
Mediorcre students	2.74	2.77	2.58	2.55	2.36	2.49	1045	30.1%
Less-developed students	2.23	1.97	2.15	2.12	1.98	2.10	439	12.7%
Left behind students	1.65	1.45	1.40	1.58	1.41	1.41	51	1.5%
Get along students	3.28	3.61	2.46	3.20	2.65	1.68	52	1.5%
Goal-oriented students	2.85	2.11	3.34	2.39	2.85	3.11	209	6.0%
Unbalanced students	3.79	3.48	3.42	2.18	1.41	1.31	11	0.3%

Results of the During School Closure Model

Data Fit for the Models

Table 5 provides insights into the latent profile analysis conducted on students' responses regarding the levels of social-emotional development and learning engagement during the COVID-19-induced school closure. AIC, BIC, and saBIC consistently decreased until the seven-class model. While BIC increased with the eight-class model, the entropy value indicated a deterioration in the quality of model classification. Based on these findings, the study opted for the seven-latent class model.

Table 6. Data Fit for the Models of During School Closure

Models	AIC	BIC	saBIC	LMR	BLRT	entropy
2	40530.26	40646.93	40586.56	0.00	0.00	0.78
3	39312.56	39472.22	39389.61	0.00	0.00	0.75
4	38923.55	39126.20	39021.34	0.00	0.00	0.76
5	38695.15	38940.79	38813.69	0.02	0.00	0.73
6	38543.26	38831.88	38682.54	0.05	0.00	0.69
7	38412.96	38744.57	38572.98	0.08	0.00	0.74
8	38379.01	38753.61	38559.78	0.76	0.00	0.72
9	38245.43	38663.01	38446.94	0.60	0.00	0.72

Note. LMR = Vuong-Lo-Mendell-Rubin likelihood-ratio test; BLRT = bootstrap likelihood ratio test.

Name and features of each latent class

In accordance with the antecedent Before School Closure Model, discrete student cohorts, such as 'Supreme Students' (14.30%), 'Model Students' (33.40%), 'Less-Developed Students' (5.2%), and 'Left-Behind Students' (32.40%), persisted throughout the School Closure Model. However, nuanced patterns and facets emerged, delineating shifts from the fall semester of 2019. A comprehensive presentation of factor levels by group is detailed in Table 7, elucidating salient findings and noteworthy features.

- Mediocre Students (30%): This group, constituting 30% of students before school closure, underwent dissolution during the closure period.
- 'Less-Developed Students (5.2%): The group exhibited a marked reduction from 12.7% to 5.2%.
- 'Left-Behind Students (32.4%) : Conversely, the 'Left-Behind Students' group, emblematic of 'at-risk students,' experienced a notable increase from 1.5% to 32.4%. This conspicuous transformation prompts an exploration into whether students from the vanished 'Mediocre Students' group and those transitioning from the 'Less-Developed Students' group have now found themselves within the 'Left-Behind Students' category.
- Goal-Oriented Students (5.3%): The 'Goal-Oriented Students' group persisted, albeit with a marginal decrease from 6.0% to 5.3%. Notably, regarding learning engagement patterns, there was an ascension in self-directed learning coupled with a reduction in cooperative learning. This observed shift may be attributed to the increased reliance on online-based distance learning with limited interaction and cooperative activities.

- Get-Along Students (4.1%): A resurgence was evident in the 'Get-Along Students' group, registering an increase from 1.5% to 4.1%. Nevertheless, it is imperative to note that the degree of cooperative learning experiences, a hallmark of this group, significantly diminished from 2.65 to 1.99.
- Studying-Alone Students (5.2%): A novel student group emerged, characterized by heightened levels of positive attitudes toward life, reinforced perseverance, and augmented self-directed learning behaviors. Paradoxically, this group exhibited diminished levels of bodily movement and participation in cooperative learning. Coined as 'Studying-Alone Students,' this cohort constituted approximately 5.2% of the total sample.

These findings illuminate the dynamic shifts in student groups during the school closure, not only delineating the challenges posed by the transition to online learning but also accentuating the resilience and adaptability exhibited by specific groups. The substantial growth in 'Left-Behind Students' beckons a deeper examination into the socio-emotional and learning engagement experiences of students potentially at heightened risk during these exceptional circumstances. Furthermore, the nuanced alterations within existing student groups emphasize the imperative for targeted interventions and support mechanisms tailored to the evolving educational milieu.

Figure 2. Latent Classes of the During School Closure Model

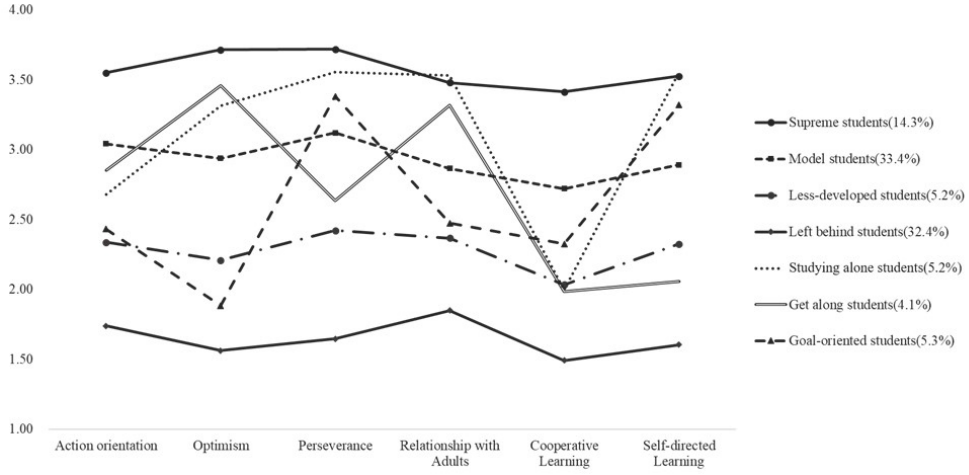


Table 7. Levels of each Factor by Group

	action orientation	optimism	perseverance	Relationship with Adults	Cooperative Learning	Self-directed Learning	n	%
Supreme students	3.55	3.72	3.72	3.48	3.41	3.53	491	14.3%
Model students	3.04	2.94	3.12	2.87	2.72	2.89	1148	33.4%
Less-developed students	2.34	2.21	2.42	2.37	2.03	2.32	178	5.2%
Left behind students	1.74	1.56	1.65	1.85	1.49	1.61	1111	32.4%
Studying alone students	2.68	3.31	3.56	3.53	2.00	3.56	180	5.2%
Get along students	2.85	3.46	2.63	3.32	1.99	2.06	141	4.1%
Goal-oriented students	2.43	1.88	3.38	2.47	2.33	3.32	183	5.3%

Changes After COVID-19 and School Closure

The goal of this study is to examine the transformations in students' social-emotional development and learning engagement patterns pre and post the outbreak of COVID-19. Experiences and activities during the fall semester of 2019 were juxtaposed with those during the period of online-based remote learning necessitated by the stringent social distancing measures imposed due to COVID-19. Employing latent profile analysis, students were classified into groups based on their social-emotional development levels and learning engagement patterns. The study delved into whether students retained their original group or transitioned to another specific group after the COVID-19 pandemic. The findings are delineated as follows.

- Persistence of 'Supreme' and 'Model' Students: Approximately 70% of students initially classified as 'Supreme Students' and 'Model Students' in the Before School Closure Model remained in their respective groups. This finding suggests that students exhibiting higher levels of social-emotional development and excelling in cooperative and self-directed learning were relatively less impacted by mandatory remote learning and social distancing prompted by COVID-19.
- Vanishing 'Mediocre Students' and Transition to 'Less Developed Students': The 'Mediocre Students' group, present before COVID-19, disappeared amidst strict social distancing and expanded distance learning. Over half of the original 'Mediocre Students' shifted to the 'Less Developed Students' group post-COVID-19, indicating substantial influence on those previously classified as 'mediocre' during normal circumstances.
- Movement from 'Less Developed' to 'Left Behind' Students: While 72.1% of students originally categorized as 'Less Developed Students' maintained their status during the school closure, 15.8% transitioned to the 'Left-Behind Students' group characterized by lower social-emotional development, limited cooperative learning experiences, and diminished self-directed learning behaviors. This smaller cohort exhibited relatively maladaptive responses to the new learning environment brought about by COVID-19.
- Adaptation of 'Get-Along Students' to 'Model Students': A modest yet significant 30.8% of students from the 'Get-Along Students' group transitioned to the 'Model Students' group, while 50% remained in their original group. This implies that students with matured social relationships and proficiency in cooperative learning successfully adapted to the challenges posed by social distancing due to COVID-19.
- Shifts in 'Goal-Oriented Students': Among 'Goal-Oriented Students,' 29% persisted in the same group, while 30.4% moved to the 'Model Students' group, and 27.1% transitioned to the 'Less Developed Students' group. Notably, activities and experiences related to social-emotional development and learning engagement for both 'Supreme Students' and 'Model Students' groups slightly decreased compared to the pre-COVID-19 circumstances.
- Disappearance of 'Mediocre Students' and Absorption into 'Less Developed' and 'Left Behind' Categories: With school closure and stringent social distancing, the 'Mediocre Students' group vanished, and its members were absorbed into either the 'Less Developed Students' or 'Left-Behind Students' groups. In these new groups, the levels of most factors were enhanced compared to the Before School Closure Model.
- Changes in 'Get Along' and 'Goal-Oriented Students': 'Get-Along Students' and 'Goal-Oriented Students' exhibited significant changes in measured values. Action orientation, optimism, and cooperative learning factors decreased, while perseverance, relationship

with adults, and self-directed learning factors increased. These shifts underscore the nuanced impact of COVID-19 on diverse student groups, influencing various aspects of their social-emotional development and learning engagement.

The changes in the levels of social-emotional development and learning engagement by group are as follows. It was found that the activities and experiences related to social-emotional development and learning engagement of both 'supreme students' and 'model students' groups decreased slightly compared to before COVID-19 circumstance. Notably, with the school closure and strong social distancing, the 'mediocre students' as a group disappeared and members of the group were absorbed into either group of 'less-developed students' or 'left behind students.' The levels of most factors in the case of 'less developed students' and 'left behind students' were enhanced compared to those of the Before School Closure Model. In addition, in the case of the 'get along students' and the 'goal-oriented students,' the measured values of action orientation, optimism, and cooperative learning factors decreased significantly, while those of perseverance, relationship with adults, and self-directed learning factors increased.

Table 8. Students' movement after COVID 19

		During school closeness						
		Supreme students	Model students	Less-developed students	Left behind students	Studying alone students	Get along students	Goal-oriented students
Before School Closure	Supreme students	307 (59.7%)	77 (15.0%)	47 (9.1%)	42 (8.2%)	11 (2.1%)	12 (2.3%)	18 (3.5%)
	Model students	149 (13.2%)	620 (55.1%)	111 (9.9%)	132 (11.7%)	27 (2.4%)	44 (3.9%)	43 (3.8%)
	Mediorcre students	14 (1.4%)	346 (33.5%)	13 (1.3%)	549 (53.1%)	25 (2.4%)	46 (4.4%)	41 (4.0%)
	Less-developed students	4 (0.9%)	21 (4.8%)	1 (0.2%)	315 (72.1%)	69 (15.8%)	7 (1.6%)	20 (4.6%)
	Left behind students	2 (3.9%)	3 (5.9%)	0 (0%)	7 (13.7%)	39 (76.5%)	0 (0%)	0 (0%)
	Get along students	3 (5.8%)	16 (30.8%)	0 (0%)	6 (11.5%)	0 (0%)	26 (50%)	1 (1.9%)
	Goal-oriented students	12 (5.8%)	63 (30.4%)	6 (2.9%)	56 (27.1%)	8 (3.9%)	2 (1.0%)	60 (29.0%)
	Unbalanced students	0 (0%)	2 (18.2%)	0 (0%)	4 (36.4%)	1 (9.1%)	4 (36.4%)	0 (0%)

Conclusion, Discussions, and Implications

This study aimed to categorize middle and high school students into groups based on the degree of social-emotional development (action-orientation, optimism, perseverance, relationship with adults) and learning engagement (cooperative learning, and self-directed learning). To examine the effects of COVID 19 on the pattern of social-emotional development and learning engagement of students, the analysis was conducted on data from two different times with the same samples. Students were asked to answer their perception and experiences about the social-emotional development and learning engagement during the fall semester of 2019 when they were able to interact with teachers and meet friends and during the spring semester of 2020 when COVID-19 required school closure and strict social distancing. Finally, a comparison was made on the results of the two analyses.

The study results can be summarized as follows. First, students were clearly classified into groups based on the level of social-emotional development and learning engagement patterns. In other words, the study found distinctive groups of which differences were evident across all factors both before and during the period of school closure. 'Supreme and model students' who excelled in all factors of social-emotional development and learning participation were found, while 'left-behind students who showed low levels in all factors without exception and was clearly distinguished from the excellent student group were also found to exist.

Second, looking at the patterns of social-emotional development in each group in this study, it suggests that the level of social-emotional skills and related experiences in the early stages of development can determine the level of development in the next stage as one gets older. Humans are by nature active and growth-oriented organisms and continue their relationships with others while participating in various activities and achieve integration through psychological and interpersonal experiences (Compton, 2007). In this sense, social-emotional development is essential for children and youth to pursue continuous psychological growth, integration, and well-being during their entire life (Deci & Ryan, 2000). In particular, youth and adolescence are a very important period when the basis for all growth and development is formed. In other words, socio-emotional development in childhood can be the basis for determining the degree of development in adolescence later. Social-emotional skills developed during this time would have an important influence on cognitive and emotional development in the future.

Another important finding was that a student's degree of socio-emotional development was closely related to the level of engagement in cooperative learning and self-directed learning. The social and emotional development formed in the school affects academic achievement and educational attainment. Finn (1989) suggested that negative academic self-concepts may interfere with subsequent academic achievement. Researchers found a significant relationship between academic self-concept and subsequent grades (Marsh & Yeung, 1997), and that academic self-concept was the result of prior academic achievement and also the result of future academic achievement (Marsh & Yeung, 1997). Previous studies have found that the relation exists between academic self-concept and academic achievement, which increases subsequent academic achievement, and high academic self-concept (Marsh, Hau, & Kong, 2002; Guay, Marsh, & Boivin, 2003). Students who perform well academically tend to experience positive school life, develop social abilities, and become involved in

positive social behavior (Chen, 2005; Skinner, Pappas, & Davis, 2005). On the other hand, Chen, Rubin, & Li (1997) suggested that children with academic difficulties were less likely to succeed in school than children with inappropriate social behavior (Chen et al., 1997). Elliott and Gresham (1993) also reported that children who behave improperly showed lower academic achievement than children who experienced social-emotional difficulties and showed no behavioral problems. The results of the current study imply that students who have difficulties in socio-emotional development due to COVID 19 may not be successfully engaged in self-directed learning and cooperative learning.

Therefore, educators and policymakers need to try to periodically diagnose whether students have successfully achieved the socio-emotional development required at each stage. When a student's development is found to be insufficient, education authorities must actively engage in educational interventions to help the student achieve this.

Finally, the study found that social distancing and school closure brought about by the COVID-19 pandemic had a differential effect on students. It has been found that social distancing, lockdown, and school closures do not have a significant effect on students who have already achieved a high level of socio-emotional competencies and who developed and well-practiced cooperative learning and self-directed learning attitudes and skills. It was also found that students with the persistence and self-directed learning abilities to overcome difficulties and pursue their own goals were relatively well adapted to the online-based remote learning environment that required self-focused study and time management. On the other hand, in this study, 'normal or average' students who showed an intermediate level in all factors of social-emotional development and learning engagement had difficulties in performing cooperative learning and active learning in a school closure situation. From a policy perspective, the results of this study suggest that education authorities should make efforts in advance so that students can develop self-directed learning abilities in case such a pandemic situation and the distant learning environment that it will cause in the future occur. Meanwhile, COVID-19 has shown the educational potential of online distance classes, which is likely to expand in the future. According to the results, students exist who are difficult to adapt to the online learning settings where they have to study alone. In this regard, the study suggests that educational measures should be prepared and implemented to help these at-risk students develop self-directed learning skills.

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