



Social competencies, classroom relationships, and academic engagement: A latent change score modeling approach among lower secondary school students

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Abstract

This longitudinal study applied latent change score (LCS) modeling to examine individual changes in students' ($N=1205$) academic engagement (behavioral and emotional), social competencies (relationship skills and social awareness), and classroom relationships (emotional support from teachers and collaborative peer relations). Average changes during the first year of lower secondary school were investigated, and an LCS model specifying that individual changes in social competencies are related to individual changes in academic engagement partially via individual changes in classroom relationships was tested. The results indicated an average decline for all variables, particularly emotional engagement. Changes in social competencies were associated with changes in classroom relationships and indirectly with changes in academic engagement via changes in emotional support from teachers. A direct association was found between changes in social awareness and behavioral engagement. The findings reflect that the promotion of social competencies in lower secondary school may foster positive classroom relationships and academic engagement, mainly via perceived social awareness for behavioral engagement or via emotional support from teachers for both dimensions of academic engagement.

Keywords Academic engagement · Relationship skills · Social awareness · Emotional support from teachers · Collaborative peer relations · Lower secondary school

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1 Introduction

Evidence suggests that students' social competencies are crucial for a spectrum of favorable developmental outcomes (Catalano et al., 2004; Engels et al., 2001) and play a key role in shaping students' successful educational trajectories (Durlak et al., 2010). At the beginning of lower secondary school, students are typically at an age when their capacity for social competence development increases (Blakemore, 2008), while developmental changes in their perceived capabilities become more comprehensive (Harter, 1990). For some students, this may lead to a negative shift in their perceptions of social competencies (Manning, 2007). Furthermore, entry into lower secondary school is typically accompanied by new social demands in association with the new and potentially more complex social contexts in which they find themselves (Strand, 2019; Ulmanen et al., 2014), resulting in disparities between their social developmental needs and the educational context (Wang & Eccles, 2013). Moreover, students' engagement in academic work simultaneously deteriorates during this period (Bakken, 2021; Diseth et al., 2020; Wang et al., 2015).

This period of rapid individual development and changes in the educational context provides an opportunity to investigate how individual changes in students' social competencies, classroom relationships, and academic engagement are related. This may facilitate an enhanced understanding of why intervention efforts aimed to enhance students' social-emotional competencies have also been suggested to be relevant predictors of academic engagement and improved relationships with teachers and peers, including better adjustment in the educational context (Domitrovich et al., 2017; Jones & Doolittle, 2017; Santos et al., 2023). Examining relationships between individual changes in these phenomena over time using longitudinal data would contribute to this. Therefore, this two-wave longitudinal panel study extends existing research by using a latent change score (LCS) model in examining individual changes during the first year of lower secondary school, including how individual changes in two social competencies (relationship skills and social awareness) relate to individual changes in academic engagement (behavioral and emotional) via individual changes in emotional support from teachers and collaborative peer relations.

1.1 The Norwegian lower secondary school context

Ten years of schooling is compulsory in Norway, and this period of education is divided into two main stages: primary school (1st to 7th grade) and lower secondary school (8th to 10th grade). Students begin attending primary school at age six and lower secondary school at age thirteen. Most Norwegian lower secondary schools are separate from primary schools, are often larger, and recruit students from multiple primary schools. Thus, students typically attend classes with new peers and teachers. Students entering secondary school are also exposed to grades for the first time and increased academic demands. That is, some students may begin to experience high achievement expectations and academic-related stress during the lower secondary school years (Bakken, 2021; Murberg & Bru, 2004). Such changes may

result in reduced integration between the social and academic contexts for affected students (Eccles & Roeser, 2009; Wang & Hofkens, 2020), all of which may negatively impact students' engagement (Hanewald, 2013; Wang & Eccles, 2013).

2 Academic engagement and its changes in lower secondary school

Following Skinner et al. (2008), we employ a motivational conceptualization of academic engagement, whereby students' engagement in academic work is constituted by their behavioral and emotional participation in the classroom. Behavioral engagement concerns students' attention, effort, and persistence in learning activities, whereas emotional engagement refers to students' affective participation, such as their enjoyment and enthusiasm. Emotional engagement is closely linked to intrinsic or autonomous motivation (Skinner et al., 2008). Each dimension is instrumental in the internal dynamics of academic engagement, reflecting students' approaches to learning. The underlying assumption is that high-quality learning results from behaviors and emotions that reflect a diligent learning effort (Fredricks et al., 2004).

Unfortunately, studies have identified an average decline in engagement during adolescence (Engels et al., 2016; Wang et al., 2015), including in Norway (Bakken, 2021; Diseth et al., 2020), where the present study was carried out. Disengagement can have severe and long-term consequences, including academic underachievement and school dropout (Skinner & Pitzer, 2012; Wang & Fredricks, 2014). One potential factor in this decline may be the academic challenges specific to this period, which include more complex peer relationships and the need to establish supportive teacher–student relationships with new and larger numbers of teachers (Engels et al., 2016; Strand, 2019). Given that the social contexts and the quality of the interactions in the educational setting may play a significant role in how well students engage with their studies (Roorda et al., 2011; Wentzel, 2003), we anticipated that individual changes in social competencies may be linked to individual changes in academic engagement via individual changes in classroom relationships (i.e., emotional support from teachers and collaborative peer relations).

2.1 Classroom relationships and academic engagement

Existing research suggests that perceived emotional support from teachers is linked to positive educational outcomes, such as enhanced self-perceptions regarding academic competence and greater commitment to learning (Furrer et al., 2014; Verschueren et al., 2012). In a more emotionally supportive classroom environment, students are more likely to share their ideas and engage in discussion, exhibit positive attitudes toward learning, and express enjoyment, as they can rely on their teachers for support (Shim et al., 2013). For instance, Furrer and Skinner (2003) found that students who perceived teachers as emotionally supportive tended to be more behaviorally and emotionally engaged with learning. In addition, the teacher–student relationship may also function as a buffer against negative emotions in the educational setting (e.g., boredom or anxiety; Furrer & Skinner, 2003), which in turn

could facilitate growth in students' academic engagement (Linnenbrink-Garcia & Pekrun, 2011).

Collaborative peer relations may also facilitate growth in students' engagement. For instance, research suggests that functional collaborative peer interactions in the learning process could result in greater productivity and engagement for learning than are achieved when working alone (Johnson & Johnson, 2017). In support of this perspective, Wentzel (2003) proposed that students who perceive opportunities to achieve their social learning goals are more likely to express greater interest in subject content and academic grades. Finally, depending on how well cooperative learning is structured within the classroom, collaborative peer relations may provide learning contexts wherein students hold one another responsible for certain standards of conduct (Wentzel & Watkins, 2002). Such contexts may engage students in investing greater effort in learning assignments. However, the potential benefits of collaborative peer relations may vary depending on the peer groups' attitudes toward and influences on schoolwork (Wentzel et al., 2018), making it difficult to form clear expectations regarding the connection between individual changes in collaborative peer relations and engagement.

Furthermore, the structural context of lower secondary school is likely to differ from that implemented at primary school level, and the first year may be socially challenging for some students. For example, emotional support from teachers has been shown to decline as students get older (Bru et al., 2010), and students tend to perceive lower secondary school teachers as less emotionally supportive (Zimmer-Gembeck et al., 2016). In addition, researchers have found that some students find it challenging to maintain functional collaborative peer relations, as they experience relationships as more sophisticated and as requiring more complex social strategies (Ulmanen et al., 2014). Nevertheless, it is challenging to accurately predict the course of change in classroom relationships during lower secondary school, particularly in perceived collaborative peer relations. That is, while the importance of social interactions in the learning process has long been recognized (e.g., Christenson et al., 2012), few studies have examined students' academic engagement in the context of collaborative peer relations throughout adolescence (Ryan et al., 2019). Moreover, despite promising indications from cross-sectional studies regarding how emotional support from teachers may serve many beneficial outcomes, very few studies have addressed the parallelity of change for emotional support from teachers and collaborative peer relations with academic engagement (Quin, 2017). Such research appears to be particularly important, given the multiple changes in the social contexts of the learning environment in lower secondary school.

2.2 Social competencies, classroom relationships, and academic engagement

Regarding social competencies, adolescence is a developmental stage of specific interest, with neurostructural and associated cognitive changes taking place in parallel with environmental changes that increase adolescents' exposure to more complex social situations (Choudhury et al., 2006). The cognitive development that occurs during this period is likely to enhance one's ability to understand and take

others' needs into consideration, including the skills required to adequately initiate and interact with others (Blakemore, 2008; Steinberg, 2017). However, growth patterns might vary due to differences in individual factors and contextual exposures (Junge et al., 2020). Moreover, developmental psychological research has found that the evaluation of oneself becomes more comprehensive and differentiated between childhood and adolescence (Harter, 1990). For some students, this more comprehensive and differentiated self-perception may lead to a decline in self-concept during the transition to lower secondary school (Manning, 2007). Young children often tend to overestimate their competence (Lipko et al., 2009). As they grow older, their increased cognitive maturity enhances their ability to integrate information from multiple sources, and thus their self-perceptions become increasingly accurate (Harter & Marold, 1991). Thus, on the one hand, cognitive maturation may enhance their social competencies, while, on the other hand, their ability to evaluate such competencies more accurately may cause a deterioration in their perceptions of their own social competencies.

Developmental and intervention studies, including in the social-emotional learning research field, indicate that promoting good social competencies is believed to benefit social settings and lead to favorable student outcomes, such as adaptive functioning, developmental thriving, positive adjustment, and higher engagement in learning (Domitrovich et al., 2017; Jones & Doolittle, 2017; Zins et al., 2007). In this study, we predicted that individual changes in two specific components of social competencies (relationship skills and social awareness) would be related to individual changes in students' classroom relationships and thereby to individual changes in academic engagement. This will be further elaborated below.

Relationship skills In accordance with the Collaborative for Academic and Social and Emotional Learning (CASEL, 2021), relationship skills were operationalized as the ability to initiate and sustain communication with others, as well as the ability to maintain supportive relationships. Students who have highly developed relationship skills tend to be more assertive and better at interacting with others (Eckenrode, 2013; Wentzel, 1994). Strong relationship skills are also linked to qualitative feedback processes and enhanced willingness to interact with peers (Van Ryzin et al., 2020). Furthermore, teachers tend to have a greater rapport with students whose relationship skills are strong, which may lead to improved teacher–student relationships (Curby et al., 2013). Consequently, these students may receive greater emotional support for their learning (Neal et al., 2011).

Moreover, given that satisfactory relationship skills may help students navigate social interactions in school, they might promote the maintenance of social connections, ensuring that they receive support and experience a sense of belonging (Gifford-Smith & Brownell, 2003; Pianta et al., 2012). Given that perceived support and a sense of belonging have been positively linked with intrinsic motivation (Klem & Connell, 2004; Ryan & Deci, 2017), relationship skills may also facilitate external resources that support students' engagement in academic work.

Social awareness In this study, social awareness refers to ones perceived ability to demonstrate compassion and empathy, by being understanding, supportive and helpful toward others. We were interested in capturing how students' social awareness translates into prosocial attitudes and behaviors. This is linked to various attributes

reflecting responsibility and carefulness (OECD, 2015), as well as the ability to show awareness of these behaviors in social situations (John et al., 2008; Roberts et al., 2004). Students who exhibit strong social awareness tend to enjoy more supportive relationships (Lerner et al., 2005) and have wider circles of close friends (Coleman & Byrd, 2003) when they exhibit helpful behavior and actions toward their peers. Socially responsible behaviors have also been linked with popularity and peer acceptance (Wentzel & Watkins, 2002), suggesting that students who behave prosocially enjoy better collaborative peer relations. Moreover, when students exhibit teacher-preferred behaviors (e.g., helpfulness; Walker et al., 1993), they are more likely to experience teacher acceptance and greater support in their learning (Jussim & Harber, 2005).

While peer rejection may contribute to academic disengagement (Wentzel, 2003), having close friends will generally provide support and companionship (Gottlieb & Bergen, 2010), which are positively related to a sense of belonging (Ryan & Deci, 2017). Moreover, acceptance by one's peers has been positively linked to satisfaction at school and the pursuit of learning goals (Wentzel, 1994), which are positively correlated with engagement in learning activities (Deci & Ryan, 2000). Students' helpful actions may also lead teachers to develop higher expectations of student achievement (Stang et al., 2009), which is likely to enhance engagement (Rubie-Davies, 2010).

3 The present study

To the best of our knowledge, this study is the first to examine how individual changes in students' social competencies are related to individual changes in academic engagement via individual changes in classroom relationships during the first year of lower secondary school. The study's main aim, therefore, was to test an LCS model with the specification that individual changes in social competencies are related to individual changes in academic engagement partly via individual changes in classroom relationships. The average latent changes in the variables during the first year of lower secondary school were also studied. Accordingly, this study addresses the following research questions:

1. What are the average changes in students' perceived social competencies (relationship skills and social awareness), classroom relationships (emotional support from teachers and collaborative peer relations), and academic engagement (behavioral and emotional) during the first year of lower secondary school? Based on the above argumentation, an average decline in students' academic engagement and classroom relationships were considered most likely. Given the cognitive and contextual changes during this period, no clear expectations regarding individual changes in students' social competencies were given.
2. How are individual changes in students' perceived social competencies related to individual changes in academic engagement via individual changes in classroom relationships? Given that well-developed social competencies may help students to navigate social interactions at school (Hattie & Andermann, 2013) with evi-

dence suggesting that interventions aimed at stimulating social competencies have also been found to support engagement in learning (Domitrovich et al., 2017) and the comprehensive literature suggesting that good affective teacher–student relationships promote academic engagement (Roorda et al., 2011), we proposed an LCS model specifying that individual changes in social competencies are positively related to individual changes in emotional support from teachers. The link between collaborative peer relations and academic engagement is less documented; thus, no clear expectations regarding indirect associations via changes in collaborative peer relations were given.

4 Method

4.1 Participants and procedure

The participants in this study were eight-graders recruited from 11 lower secondary schools located within a single large municipality in eastern Norway. We employed a longitudinal panel design with two data collection time points. At each time point, participants completed a digital questionnaire in the classroom with a teacher present. The first assessment (T1) took place at the beginning of 8th grade (September 2018). At the second time point (T2: March 2019), 1094 (51% female) students completed the questionnaire (age 14–15 years). Nine cases were excluded due to poor response quality, leaving a final sample of $N=1085$ at T2. A total of $N=1205$ students were included in either T1 or T2 or at both time points. Accordingly, the average number of participants across schools were $n=110$.

This study is part of a longitudinal research project, and the students received two slightly different approaches to social-emotional learning, one psychologically oriented intervention (see Vestad & Tharaldsen, 2022), and one with a philosophical basis facilitating dialogues including rhetorical exercises (see Weiss & Helskog, 2022). Both interventions taught students about competencies regarding communication, interaction, and consideration for others. The study is approved by the Norwegian Centre for Research Data and follows the ethical standards of the Norwegian Data Protection Authority. Participation was voluntary, and only participants with written parental consent were permitted to participate in the study. The participants were assured of confidentiality and informed of their right to withdraw at their own discretion at any time.

4.2 Measures

All scales used a six-category scoring format ranging from 1 (*totally disagree*) to 6 (*totally agree*). Cronbach's alpha and McDonald's omega are reported for scale reliability. In cases wherein the two differed, the omega value should be emphasized as it takes into consideration the factor loadings from the confirmatory factor analysis (CFA).

Academic engagement was measured using a revised version of Skinner et al.'s scale (2008; previously documented by Eriksen & Bru, 2021; Vestad et al., 2022). Behavioral engagement included four items estimating students' attention, effort, and persistence while initiating and participating in learning activities (e.g., "I listen carefully," "I pay attention during class"). Cronbach's α was 0.87 and McDonald's ω was 0.85 at T1, with $\alpha=0.92$ and $\omega=0.93$ at T2. Emotional engagement included four items assessing students' emotional engagement (e.g., "The subjects we have at school interest me," "I like doing schoolwork"). Cronbach's α was 0.93 and $\omega=0.93$ at T1, while at T2, $\alpha=0.95$ and $\omega=0.95$.

Emotional support from teachers To assess students' perceptions of emotional support from teachers, they were administered a scale developed for this study and documented by Vestad et al. (2022) that included the five items: "I can trust my teachers," "My teachers will always help me if I have problems," "I feel my teachers believe in me," "I feel my teachers care about me," and "I feel that teachers appreciate me." Cronbach's α was 0.91 and $\omega=0.95$ at T1. At T2, $\alpha=0.94$ and $\omega=0.95$.

Collaborative peer relations were measured using a five-item scale that included the following items: "I collaborate with fellow students to understand lessons," "I help other students to understand lessons," "I encourage my fellow students to make an effort when struggling with schoolwork," "My fellow students help me understand the learning materials," and "My fellow students encourage me to make an effort when I struggle with schoolwork." The scale was previously documented by Vestad et al. (2022). Cronbach's α for the scale was 0.88 and ω was 0.89 at T1, whereas for T2, $\alpha=0.93$ and $\omega=0.93$.

Relationship skills were measured using a five-item scale documented by Eriksen and Bru (2021) and Vestad et al. (2022) and to capture students' perceptions of their own ability to connect with peers (e.g., "I get to know others easily" and "I capture the interest of others in a positive way"). Cronbach's α was 0.90 and ω was 0.90 at T1. At T2, $\alpha=0.92$ and $\omega=0.93$.

Social awareness Students were administered a scale developed for this study to capture their experiences of how other students perceived them with respect to helpful behavior and actions. The scale consisted of the introductory phrase "I think others perceive me as," followed by five complementary items: "helpful," "caring," "supportive," "kind," and "understanding." Internal consistency was good as Cronbach's α was 0.92 and ω was 0.93 at T1, and at T2, $\alpha=0.95$ and $\omega=0.95$. The measurement model for this construct yielded good fit: χ^2 (df)=138.14 (34), RMSEA: 0.05 (90% CI 0.04–0.06), CFI: 0.98, TLI: 0.97, SRMR: 0.02, and factor loadings for both time-points were all >0.80 , supporting good model fit as well as construct validity. Moreover, correlations with the measure of relationship skills were of the expected direction and size in T1 and T2, as well as for the latent change scores ($r=0.50$, 0.51 and 0.46 , respectively).

4.3 Control variables

Gender was included as a control variable concerning changes in classroom relationships. Although findings regarding gender differences in classroom relationships are

sparse, several indicators suggest that females are more likely than males to establish relationships and have more positive perceptions of teachers and peers (Brass et al., 2019). Gender was measured using a dichotomous variable: 1 = males and 2 = females.

Social-emotional learning approaches A dichotomous variable for which the values 1 was given for the psychological oriented intervention and 2 for the philosophical based intervention.

Grade point average (GPA) was controlled for, due to the assumption that students' academic achievement is correlated with their academic engagement (Klem & Cornell, 2004). We used the average grade across the subjects Norwegian, English, and math after the first semester, ranging from 1 (*lowest*) to 6 (*highest*). The average GPA was 3.44, with a standard deviation of 0.92.

4.4 Statistical analyses

The study employed an LCS model to investigate average individual changes in variables and to test the model for associations between individual changes across the two time points. LCS is known to be suited to investigate development and parallel developmental courses in life and how variables of change affect each other across time (Klopck & Wikrama, 2020). LCS are error-free estimates of individual changes between the two time points (Castro-Schilo & Grimm, 2018). By using individual change scores in the structural model, several confounding factors related to stable individual factors could be discounted.

First, and in alignment with research question 1, the unconditional LCS for each variable was estimated directly from longitudinal CFA. The latent factor of the second time point was decomposed into a latent factor for the first time point (T1) and a true LCS ($T_2 = T_1 + (T_2 - T_1)$). This was done by letting the latent variable from the second time point be perfectly regressed on the latent variable from the first time point with a residual of zero. In the equation $(T_2 - T_1)$ represent the error-free LCS to be further used in structural equation modeling (SEM; Reuter et al., 2010). Unconditional LCS models with a significant mean indicate that individuals on average decrease (or increase) over the two time points. A significant variance for the same measure suggests a variability around the mean in which not all individuals have decreased (or increased) (McArdle & Grimm, 2010). Second, and in line with the second research question, the unconditional LCS of study variables was modeled in SEM. To prevent higher correlations for the same indicators across time, indicator-specific effects were modeled by adding time-invariant method factors. Indirect effects were investigated following the recommendations of MacKinnon and colleagues (2004) using a bias-corrected bootstrap procedure to estimate 95% confidence intervals (CI).

Mplus (version 8.4) with maximum likelihood estimation with robust standard errors was used in the estimation to evaluate goodness-of-fit by the root mean square error of approximation (RMSEA), comparative fit index (CFI), the Tucker-Lewis index (TLI), and standardized root mean square residual (SRMR). Following Hu and Bentler (1998), RMSEA with a cut-off value close to < 0.06 was considered

to indicate good fit, while <0.08 was considered to indicate acceptable fit, supplemented by a 90% CI. A cut-off value close to <0.95 was used for TLI and CFI. An adequate fit is also supported when a cut-off value close to <0.08 is used for SRMR (Hu & Bentler, 1998).

As students were nested within schools and classes intraclass correlation (ICC) was examined for all variables. Results of ICC suggested a small amount of classroom-level dependency ranging between 0.01 and 0.05. Design effects were calculated and were below the suggested cut-off at 2 (ranging between 1.0 and 1.9). Owing to the low dependency of the nested data, multi-level analysis was not an option; instead, type complex was used in analysis to adjust the standard errors. Longitudinal measurement invariance was tested by constraining the factors (metric invariance) and intercepts (scalar invariance) to be equal across time and to be compared to the freely estimated models (configural invariance). The criterion suggested by Cueng and Rensvold (2002), allowing change of ≤ 0.01 in the CFI for scalar measurement invariance, was met for all variables.

4.5 Missing data analysis

The analyses used to explore the mechanisms of missing values (Little, 1988) revealed that the data were not completely missing at random (MCAR: chi-square = 114.17 (42), $p = .000$). To handle the total sample of missingness, which ranged between 6 and 11%, including increased precision to reduce bias, auxiliary variables that were highly correlated with the study variables were included in the estimation. The use of multivariate estimation also increased the probability of missing at random (MAR: unobserved variables were missing at random). Therefore, the full information maximum likelihood (FIML) procedure was used in the estimation to minimize potential bias (Enders, 2010). This indicates that the total sample of 1205 students was taken into account in the estimation. The results were also checked for potential biases by running and comparing models with FIML imputation and the listwise deletion of missing data. The results from the two model types were the same, with only minor differences in decimals for the standardized indices.

4.6 Results

4.6.1 Longitudinal measurement models

The results of the longitudinal measurement models showed an acceptable fit. Factor loadings for the dependent variable behavioral engagement were adequate through strong for both time points: T1: 0.55–0.93 and for T2: 0.69–0.97. To ensure an acceptable model fit, the error terms of the two first items were allowed to correlate: “In class, I work as hard as I can” and “I put a lot of effort into doing well at school.” Strong factor loadings at both time points were evident for the dependent variable emotional engagement: T1: 0.84–0.93; T2: 0.90–0.94. To have an acceptable model fit, error terms for the items “I like to keep up with my schoolwork” and “I think it’s fun to work with the subjects” were correlated. This is also known from

previous research with similar age groups (e.g., Tvedt et al., 2021). The longitudinal measurement model for the intermediate variable emotional support from teachers also showed strong factor loadings: T1: 0.74–0.91; T2: 0.82–0.95. The same were the case for the intermediate variable collaborative peer relations: T1: 0.73–0.84; T2: 0.83–0.90, as well as for the independent variables for relationship skills: T1: 0.66–0.92; T2: 0.80–0.88 and social awareness: T1: 0.81–0.89; T2: 0.84–0.93.

4.6.2 Unconditional LCS models

Model fit, mean, variance, and standard deviation for the unconditional LCS models are provided in Table 1.

Skewness and kurtosis are given for saved factor scores representing the LCS, because Mplus does not give skewness and kurtosis for the LCS. In alignment with the first research question of how students change during the first year of lower secondary school, all variables showed, on average, a significant negative change. The highest negative LCS mean was for Δ emotional engagement, while Δ emotional support from teachers, Δ collaborative peer relations, and Δ behavioral engagement also had negative LCS means. Δ relationship skills and Δ social awareness had the lowest negative change. Nonetheless, a significant variation for all variables indicated that not all students had a negative change. To support this notion and to illustrate such dispersion around the average change, the standard deviation ($\sqrt{S^2}$) for the LCS is provided for all study variables in Table 1. For example, Δ emotional engagement had a SD of 1.20, which indicates that for approximately 66.6% of the sample closest to the LCS mean ($\pm 1SD$), students' perceived change in emotional engagement will range from a slightly positive change of 0.54 to a substantially more negative change of -1.86 . For 95% of the sample, the perceived change would range from a rather strong positive change of 1.69 to a substantial negative change of -3.01 . The results of bivariate correlations of LCS for the study variables are found in Table 2.

Overall, the correlations varied from strong to weak. The strongest LCS correlation was between Δ behavioral- and Δ emotional engagement ($r=.53$). Strong bivariate correlations were also apparent for Δ emotional support from teachers and Δ collaborative peer relations ($r=.52$), as well as for Δ collaborative peer relations and Δ relationship skills ($r=.49$). The weakest correlations were between Δ emotional engagement and Δ relationship skills ($r=.17$), and for Δ behavioral engagement and Δ relationship skills ($r=.19$).

4.6.3 LCS in structural equation modeling

The second research question addressed the extent to which individual changes in social competencies were related to individual changes in academic engagement via individual changes in classroom relationships. The structural LCS model was estimated with Δ social awareness and Δ relationship skills as independent variables, perceived Δ emotional support from teachers and Δ collaborative peer relations as intermediate variables, and Δ behavioral and Δ emotional engagement as dependent variables. Gender, SEL approaches, and GPA were the control variables. The structural model yielded an acceptable fit: $\chi^2 = 3654.68(1600)$, RMSEA: 0.04 (90%

Table 1 Unconditional model fit, means, variances, and standard deviations (SDs) for LCSs. Skewness and kurtosis are given for factor change scores generated from the LCS analyses. Factor determinacy indicates correlations between the original and saved LCS

| | χ^2 (df) | RMSEA | CFI | TLI | SRMR | Average latent change LCS MA | Variance of the LCS S^2 | Sd for LCS MA | Factor determinacy | Skewness for LCS | Kurtosis for LCS |
|--|---------------|------------------|------|------|------|------------------------------|---------------------------|---------------|--------------------|------------------|------------------|
| Δ behavioral engagement | 153.86 (22) | 0.07 (0.06–0.09) | 0.96 | 0.94 | 0.06 | -0.33*** | 0.58*** | 0.76 | 0.95 | -1.02 | 2.55 |
| Δ emotional engagement | 139.12 (23) | 0.07 (0.06–0.08) | 0.98 | 0.97 | 0.03 | -0.66*** | 1.44*** | 1.20 | 0.95 | -0.37 | 0.61 |
| Δ emotional support from teachers | 151.20 (39) | 0.05 (0.04–0.06) | 0.98 | 0.98 | 0.05 | -0.44*** | 0.85*** | 0.92 | 0.98 | -0.75 | 5.75 |
| Δ collaborative peer relations | 238.96 (38) | 0.07 (0.06–0.08) | 0.95 | 0.94 | 0.06 | -0.34*** | 0.83*** | 0.91 | 0.94 | -0.96 | 4.30 |
| Δ relationship skills | 300.69 (38) | 0.08 (0.07–0.08) | 0.94 | 0.93 | 0.06 | -0.21*** | 1.01*** | 1.00 | 0.94 | -0.93 | 4.91 |
| Δ social awareness | 118.42 (38) | 0.04 (0.04–0.05) | 0.98 | 0.98 | 0.05 | -0.15*** | 0.86*** | 0.93 | 0.96 | -0.70 | 5.99 |

*** = $p < .001$

Table 2 Correlation of latent change scores (LCSs)

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|-----|-----|-----|-----|-----|---|
| 1. Δ behavioral engagement | 1 | | | | | |
| 2. Δ emotional engagement | .53 | 1 | | | | |
| 3. Δ emotional support from teachers | .34 | .36 | 1 | | | |
| 4. Δ collaborative peer relations | .28 | .24 | .52 | 1 | | |
| 5. Δ relationship skills | .19 | .17 | .29 | .49 | 1 | |
| 6. Δ social awareness | .28 | .20 | .34 | .52 | .46 | 1 |

** $p < 0.01$

CI 0.04–0.04); CFI: 0.94; TLI: 0.93; SRMR: 0.05. The explained variance of the indicator-specific effects for behavioral engagement were all adequate (0.04–10.2%; emotional engagement: 2.8–4.9%, emotional support from teachers: 1.1–2.8%, collaborative peer relations: 3.8–21.3%, relationship skills: 1–15.6% and social awareness: 1.6–6.5%), and the results thus indicated that, at most, 21.3% of study variables variability was explained by indicator-specific effects, suggesting that the observed measures were relatively homogenous across the two time points for the latent variables.

Continuing research question 2, the correlation of change between Δ social awareness was relatively strongly and positively associated with perceived Δ collaborative peer relations and significantly associated with perceived Δ emotional support from teachers. It was also directly associated with Δ behavioral engagement. Δ relationship skills were significantly associated with perceived Δ collaborative peer relations and weaker but statistically significantly with perceived Δ emotional support from teachers. Moreover, perceived Δ emotional support from teachers was positively related to Δ emotional and Δ behavioral engagement. Δ collaborative peer relations did not reach any significant association with Δ emotional and Δ behavioral engagement. Altogether, Δ relationship skills and Δ social awareness accounted for 13% of the variance in teachers Δ emotional support and for 36% in Δ collaborative peer relations. These LCS variables further explained 15% of the variance in Δ emotional engagement and 14% of the variance in Δ behavioral engagement.

4.6.4 Indirect effects

The results of the indirect effects using a bias-corrected bootstrap procedure (MacKinnon et al., 2004) showed that for Δ relationship skills via Δ emotional support from teachers with Δ emotional engagement were relatively weak, yet significant ($\beta = 0.05$; 95% CI 0.02–0.09). A stronger result was noted for Δ social awareness via Δ emotional support from teachers with Δ emotional engagement ($\beta = 0.08$; 95% CI 0.05–0.13). By contrast, Δ relationship skills ($\beta = 0.02$; 95% CI -0.02 – 0.06) and Δ social awareness ($\beta = 0.02$; 95% CI -0.02 – 0.07) via Δ collaborative peer relations, were non-significant. The indirect effect of Δ relationship skills with Δ behavioral engagement via Δ emotional support from teachers was significant ($\beta = 0.04$; 95% CI 0.02–0.08). The same was true for Δ social awareness through Δ emotional support

from teachers with Δ behavioral engagement ($\beta=0.07$; 95% CI 0.03–0.11). However, the indirect effects of Δ relationship skills and Δ behavioral engagement via Δ collaborative peer relations ($\beta=0.02$; 95% CI -0.01 – 0.06), and Δ social awareness through Δ collaborative peer relations ($\beta=0.02$; 95% CI -0.02 – 0.08) with behavioral engagement were not significant. This suggests that in this study, Δ collaborative peer relations were not related to Δ emotional- or Δ behavioral engagement.

5 Discussion

By following students through the first year of lower secondary school, this longitudinal study aimed to expand existing cross-sectional research by testing an LCS model that specified that individual changes in social competencies are related to individual changes in academic engagement via individual changes in classroom relationships. The findings are discussed below.

Average changes in social competencies, classroom relationships, and academic engagement.

In line with our hypotheses, an average decline was found for academic engagement and classroom relationships during the first year of lower secondary school. Emotional engagement showed the most substantial decline, followed by emotional support from teachers and behavioral engagement as well as collaborative peer relations. The average decline in academic engagement corroborates existing research, suggesting that students experience reduced engagement in academic work while transitioning to lower secondary school (Bakken, 2021; Wang et al., 2015). The strong decline in emotional engagement aligns with Hagenauer and Reitbauer's (2013) findings, indicating that students transitioning to lower school began with relatively high levels of emotional engagement, which decreased as the school year progressed. This pattern also aligns with the stage-environment theory which attributes the average decline to mismatch between the new social structures, academic demands, and developmental needs (Eccles & Roeser, 2011). Given that students are less likely to be capable of sustaining behavioral participation when they experience emotional disaffection (Pekrun et al., 2010), a negative change in the perceived relevance of schoolwork and difficulties in coping with academic demands may also account for the average decline in behavioral engagement. Nonetheless, the significant variance for emotional engagement in the present study suggests that not all adolescent students experienced decrements during this period.

Our findings add to the growing body of evidence indicating that classroom relationships decline in lower secondary school. The average decline in perceived emotional support from teachers may be associated with students' exposure to new teachers as they move from the smaller, more personalized classroom environment in primary school to the larger, more achievement-oriented environment in lower secondary school, which might make it more challenging for some students to establish supportive relationships (Ulmanen et al., 2014). In addition, lower secondary

school students tend to be more oriented toward grades, competition, and their own achievements than primary school students (Weissbourd et al., 2014). Such changes might make collaborative peer relations more challenging, as students might develop a negative interdependence between performance and goal achievement (Johnson & Johnson, 2017).

Two processes working in opposite directions may explain the more modest decline in social competencies. That is, cognitive maturation is likely to improve social competencies (Blakemore, 2008; Steinberg, 2017), while improved capacity for more accurate self-evaluation has been shown to produce a decline in perceived competencies (Harter, 1990). As part of the latter process, some students will likely experience a negative shift in their self-perceptions of their social competencies and confidence to adequately interact with others in the educational setting (Manning, 2007). Moreover, results for collaborative peer relations may indicate that students find social interactions in lower secondary school more complex and demanding than in primary school (Ulmanen et al., 2014), thus reducing their perceived social competencies. This interpretation opens up for the possibility of a bi-directional relational between social competencies and classroom relationships. The causal dominance between individual social competencies and perceptions of classroom relationships will be of interest to future research but requires further points of measurement to facilitate the implementation of random intercept cross-lagged models.

5.1 Individual changes in social competencies and their relationship with individual changes in classroom relationships and academic engagement

This study's main objective was to examine how individual changes in students' academic engagement were related to individual changes in social competencies, and whether individual changes in classroom relationships acted as intermediate variables. The findings yielded some support for this model. Students who exhibited more positive individual changes in social competencies also showed more positive individual changes in classroom relationships. These longitudinal relationships reinforce findings from existing cross-sectional research suggesting that the ability to initiate and sustain communication, including supporting and helping one's peers, may make it easier to integrate into peer groups and establish positive relationships around collaborative schoolwork (Van Ryzin et al., 2020). Our findings suggest that to maintain a supportive classroom climate for students in lower secondary school, it may be beneficial to have a specific focus on supporting their social competencies. Although the LCS model specified that perceived social competencies influence collaborative peer relations and emotional support from teachers, the link between social competencies and classroom relationships is likely to be reciprocal. That is, while social competencies could be stimulated by specific curricula for

social-emotional learning, it is also possible that social competencies are influenced by certain environmental factors in the classroom setting (Howe & Mercer, 2007).

As hypothesized, individual changes in social competencies yielded statistically significant indirect associations with individual changes in academic engagement via individual changes in emotional support from teachers. This aligns with previous findings in earlier cross-sectional research linking prosocial behaviors to greater teacher acceptance and better teacher–student relationships, resulting in greater emotional support for students (Neal et al., 2011) and enhanced academic engagement (Eriksen & Bru, 2021). However, the results of the structural model showed no indirect associations via individual changes in collaborative peer relations, as individual changes in collaborative peer relations were non-significantly related to academic engagement when the individual changes in emotional support from teachers were included. When entered as the only intermediate variable, weak but statistically significant positive associations with individual changes in academic engagement emerged. The results suggest that individual changes in emotional support from teachers are likely to be more crucial for academic engagement than individual changes in collaborative peer relations, which further supports earlier findings indicating that perceived emotional support from teachers may play an essential role in shaping students' academic engagement (Roorda et al., 2011). The findings from this study propose that enhancing students' perceptions of emotional support from teachers may have the potential to counteract declining academic engagement.

More unexpectedly, the modification indices indicate that the structural model should allow for a direct association between changes in students' social awareness and behavioral engagement. Changes in perceived socially responsible behaviors could overlap trajectories of conscientiousness, which comprise aspects of dedication, responsibility, carefulness, and perseverance (Costa & McCrae, 1998; OECD, 2017). This might reflect that students who exhibit more positive development in terms of behavioral aspects of social awareness could also develop a greater sense of responsibility and take greater leadership toward their schoolwork, leading to the pursuit of learning goals and engagement in learning activities. This supports the finding that conscientious individuals are more likely to exhibit higher persistence and performance motivation (Richardson & Abraham, 2009). However, further research is necessary to clarify this relationship.

Methodological considerations

Although the present study investigated short-term changes over a six-month period, a longitudinal design and the study's large sample, including employing an LCS model, were considered methodological advantages. The longitudinal approach made it possible to analyze a structural model using LCSs, reducing the risk of spurious relationships owing to stable factors that can affect independent, intermediate, and/or dependent variables simultaneously. Finally, some of the individual changes were both positive and negative and some had relatively high kurtosis. This was handled by the LCS approach and the robust maximum likelihood estimator. The scale assessing social awareness was developed for this study to assess behavioral

responsible aspects of social awareness. The measurement model yielded good fit to data and indicated that the social awareness scale measured a uniform concept distinct from the other concepts of the study. Analysis of internal consistency also indicated good psychometric properties. The correlations of the measure of social awareness with the measure of relationship skill was in the expected direction and size. Yet, future studies are needed to further validate this scale. All data, except for information about academic achievement, were based on self-report. Future research combining self- and teacher reports or using observational data will strengthen the knowledge base in this field of research. With the inclusion of more time points, it will also be possible to implement statistical approaches that are better at exploring the causal directions or dominance between social competencies, classroom relationships, and academic engagement (e.g., random intercept cross-lagged modeling).

6 Conclusion

The findings indicate that students, on average, experience declines in perceived social competencies, collaborative peer relations, emotional support from teachers, and academic engagement (behavioral and emotional) during the first year of lower secondary school. However, substantial variations in individual changes emerged, and some students experienced positive changes in the variables studied. Moreover, individual changes in social competencies were related to individual changes in emotional support from teachers and collaborative peer relations. Indirect associations with individual changes in academic engagement occurred mainly via individual changes in emotional support from teachers. Furthermore, and somewhat more surprisingly, we identified a direct association between individual changes in social awareness and individual changes in behavioral engagement. The results from this study of individual changes during the first year of lower secondary school corroborate findings from cross-sectional studies regarding the link between perceived emotional support from teachers and academic engagement. Considering the new and potentially complex environment that is characteristic of lower secondary school, we considered that knowledge regarding the dynamic changes and associations of these in students' social competencies, classroom relationships, and academic engagement is essential. Although our LCS model was formed based on theoretical assumptions, the results do not offer an empirical basis for conclusions about the directions of causal relationships between the variables. Therefore, researchers should examine the likely reciprocal links of these variables over an extended period and conduct experimental trials to facilitate causal inferences (Figs. 1 and 2).

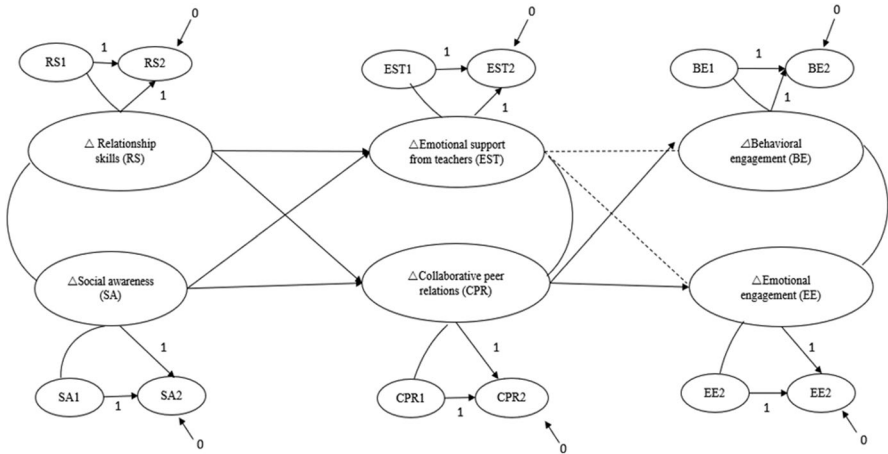


Fig. 1 Hypothesized model of the links between perceived social competencies, classroom relationships, and academic engagement. *Note:* Dotted lines indicate uncertain expectations

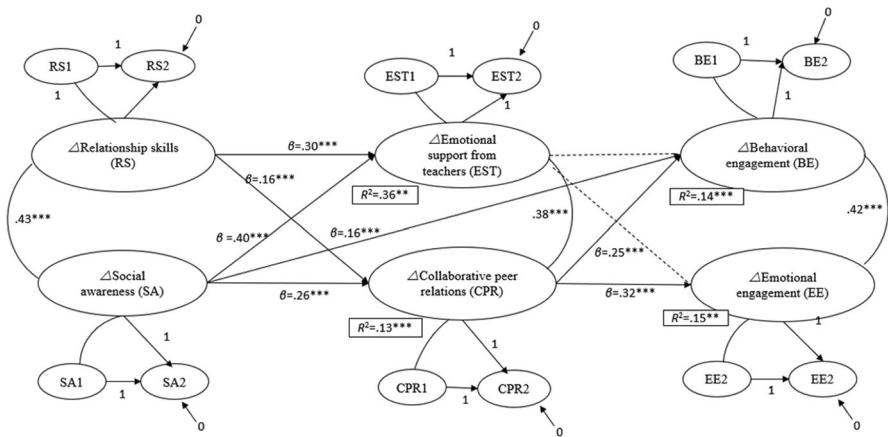


Fig. 2 LCS in SEM with indicators of individual changes in social competencies, classroom relationships, and academic engagement. For ease of model display, correlations, means, intercepts, and factor loadings are not included in the figure. *Note* Gender, social-emotional learning approaches, and GPA were entered as covariates

Appendix

See Table 3.

Table 3 Model fit for longitudinal measurement models as well as testing for scalar longitudinal measurement invariance based on the CFI criteria ($\Delta\text{CFI} < .01$) recommended by Cheung and Rensvold (2002)

| | χ^2 (df) | RMSEA (90%CI) | CFI | TLI | SRMR | ΔCFI | Number of free parameters |
|--|---------------|------------------|------|------|------|--------------------|---------------------------|
| <i>Behavioral engagement</i> | | | | | | | |
| Configural | 62.77 (17) | 0.05 (0.04–0.06) | 0.98 | 0.97 | 0.04 | 0.00 | 27 |
| Metric | 70.71 (20) | 0.05 (0.04–0.06) | 0.98 | 0.98 | 0.05 | 0.00 | 24 |
| Scalar | 119.76 (23) | 0.06 (0.05–0.07) | 0.97 | 0.96 | 0.07 | –0.01 | 21 |
| <i>Emotional engagement</i> | | | | | | | |
| Configural | 107.00 (18) | 0.07 (0.06–0.08) | 0.98 | 0.97 | 0.02 | 0.00 | 26 |
| Metric | 123.03 (21) | 0.07 (0.06–0.08) | 0.98 | 0.97 | 0.03 | 0.00 | 23 |
| Scalar | 133.20 (24) | 0.06 (0.05–0.08) | 0.98 | 0.97 | 0.04 | 0.00 | 20 |
| <i>Emotional support from teachers</i> | | | | | | | |
| Configural | 148.01 (34) | 0.06 (0.05–0.07) | 0.98 | 0.97 | 0.04 | 0.00 | 31 |
| Metric | 156.68 (38) | 0.05 (0.04–0.06) | 0.98 | 0.98 | 0.04 | 0.00 | 27 |
| Scalar | 177.23 (42) | 0.05 (0.05–0.06) | 0.98 | 0.98 | 0.05 | 0.00 | 23 |
| <i>Collaborative peer relations</i> | | | | | | | |
| Configural | 270.17 (34) | 0.08 (0.07–0.09) | 0.94 | 0.92 | 0.03 | 0.00 | 31 |
| Metric | 294.69 (38) | 0.08 (0.07–0.09) | 0.94 | 0.93 | 0.05 | 0.00 | 27 |
| Scalar | 321.82 (42) | 0.08 (0.07–0.09) | 0.93 | 0.93 | 0.06 | –0.01 | 23 |
| <i>Relationship skills</i> | | | | | | | |
| Configural | 282.39 (33) | 0.08 (0.07–0.09) | 0.94 | 0.92 | 0.04 | | 32 |
| Metric | 321.84 (37) | 0.08 (0.08–0.09) | 0.94 | 0.92 | 0.06 | 0.00 | 28 |
| Scalar | 447.51 (41) | 0.08 (0.07–0.09) | 0.93 | 0.92 | 0.07 | –0.01 | 24 |
| <i>Social awareness</i> | | | | | | | |
| Configural | 138.14 (34) | 0.05 (0.04–0.06) | 0.98 | 0.97 | 0.02 | | 31 |
| Metric | 146.87 (38) | 0.05 (0.04–0.06) | 0.98 | 0.97 | 0.04 | –0.01 | 27 |
| Scalar | 167.13 (42) | 0.05 (0.04–0.06) | 0.97 | 0.07 | 0.04 | 0.00 | 23 |

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Declarations

Conflict of interest No potential conflict of interest was reported by the author(s).

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