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Student Engagement in Learning: Exploring the Role of Perceived Student Cohesiveness, Equity, Teacher Support, and Teacher Autonomy Support Under the Framework of Self-Determination Theory

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Abstract: The academic achievement of secondary students remains a top goal for an increasing number of parents, teachers, administrators, students, and policymakers. This is because students with high academic learning outcomes gain a lot in the long run, including future admission success in college or university and later in the workforce. As a result, all educational stakeholders must focus on figuring out how to raise student academic achievement. One of the promising avenues to increase academic achievement is student engagement. According to self-determination theory, satisfying a student's need for relatedness, autonomy, and competence is one of the conditions for raising student engagement. This study, therefore, mainly examined how the classroom environment of student cohesiveness (SC), equity (EQ), teacher support (TS), and teacher autonomy support (TAS) predicts behavioral engagement (BE), cognitive engagement (CE), emotional engagement (EE), and agentic engagement (AE) of students. Data were collected from 305 students (150 males and 155 females) in four purposively selected secondary schools in the Nyamagabe district of Rwanda. The four subscales from the What Is Happening In this Class (WIHIC) questionnaire, the Learning Climate Questionnaire, and the Student Engagement Scale were used to collect data. Data were analyzed using the Mean and SD, multivariate analysis of variance, and regression analyses. Based on the results, the SC, TS, EQ, and TAS were significantly related to all components of student engagement (BE, CE, EE, and AE). There was a significant difference between boys' and girls' perceptions of BE and TAS. Gender, SC, and EQ predict BE; TAS predicts CE; EQ and TAS predict EE; and SC, TS, and TAS predict AE. Thus, responding to students' SC, TS, EQ, and TAS needs is crucial as they can foster student engagement in various aspects.

Keywords: student cohesiveness, equity, teacher support, teacher autonomy support, student engagement, secondary school, self-determination theory

1. Introduction

The academic achievement of secondary students has been and remains a top goal for an increasing number of parents, teachers, administrators, students, and policymakers. This is because students with high academic learning outcomes gain a lot in the long run, including future admission success in college or university and later in the workforce [1]. As a result, all educational stakeholders must focus on figuring out how to raise student academic achievement. One of the promising avenues that is still being researched to raise academic achievement is student engagement [2]. Student engagement is an essential indicator of the student's quality of learning process and is associated with greater and longer-term academic and social success. It displays how actively learners participate in class activities and tasks on a behavioral, emotional, cognitive, and agentic level [2]. Therefore, it is crucial to investigate which teachers' effective practices may enhance student engagement.

Self-determination theory (SDT) provided the theoretical foundation for this investigation. According to SDT, humans have three psychological needs: competence, autonomy, and relatedness [3]. Relatedness is the drive to establish intimate bonds with people to foster a sense of belonging and avoid relationship breakdown. Autonomy is having strong intrinsic motivation and control over procedures and results. In contrast, competence need is the drive to succeed, set goals, get closer to success, and stay away from failure. Satisfying SDT needs leads to enhanced motivation, creativity, and task engagement [3]. Otherwise, engagement is compromised when these needs are not met. In the context of this study, Student cohesiveness (SC) addresses relatedness, teacher support (TS) is linked to both competence and relatedness, equity (EQ) contributes to relatedness and competence, and teacher autonomy support (TAS) aligns with autonomy [4]. Consequently, the present study on students' perceived peer and TS, EQ, and TAS is based on these psychological needs to examine whether they can influence student engagement. Examining

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how they affect student engagement could provide support for teachers to further explore and create ways to foster student engagement in the learning process, which consequently may enhance students' academic achievement.

2. Literature Review

Engagement is conceptualized as a learner's level of active and productive participation in a learning task [5]. Studies offered sufficient empirical evidence to show its significant relationships with various beneficial variables in the educational context, such as academic achievement across all educational levels, effective time management [2], improved school completion and delinquency, good learning state and commitment [6], psychological well-being [7], academic adjustment [8], dropout, and less prone to misconduct and school abandonment [9, 10].

Engagement is a concept that encompasses certain aspects of commitment to learning or involvement in learning [2]. These aspects include behavioral, cognitive, emotional, and agentic engagement. Behavioral engagement (BE) refers to the visible behaviors and actions that students exhibit during the learning process, such as attending class, persistence in the subject matter, finishing their assignments, making an effort, and taking part in lessons [11, 12]. Cognitive engagement (CE) reflects students' psychological awareness of the effort put forth in learning activities, attention, concentration, and persistence [12]. Emotional engagement (EE) is defined as a student's sense of belonging in the classroom, appreciation of learning-related results, and lack of boredom, anger, and worries [13]. Agentic engagement (AE) describes the proactive and mutually beneficial steps that students take to raise their academic standing and create a more supportive learning environment for themselves. The AE is understood as the observable classroom events in which the learner constructively contributes to his/her learning and the instruction he/she receives [14]. While CE is manifested in one's concentration, attention, and problem-solving strategies toward the learning activities at hand, AE is manifested in the learner's constructive contribution to the flow of instruction received. These contributions include offering input, making suggestions, and letting the teacher know what one (learner) wants, prefers, or is interested in [14].

The above definitions of four aspects of engagement imply that teachers who want to encourage their students to be more engaged have to build a more inclusive, fair, and autonomous supportive teaching and learning process. These attributes may be achieved by creating a learning environment characterized by student relatedness (cohesiveness), competence (TS, EQ), and autonomy (TAS). This is because a peer-supportive connection between students and between the teacher and students, as well as the teacher's assistance and fairness, all contribute positively to the learning environment that fosters student engagement [6] and leads to positive learning outcomes [15]. Besides, students express more enjoyment, internal motivation, and learning efforts when they perceive their teachers as supporting their autonomy [16]. Moreover, a positive teacher relationship advances EQ and protects youth from being victimized [17].

Student cohesion (SC) is the measure of how friendly, helpful, and encouraging students are to one another [18]. It reflects a learning environment in which students feel accepted and integrated by their peers [6, 18]. Student cohesion is advantageous because academic performance is more likely to be high among students who do not experience harassment or discrimination by their classmates [19].

Furthermore, students who study in an encouraging atmosphere are more likely to experience acceptance from their peers and to be free to make errors without worrying about being laughed at [20]. Researchers underscore the importance of the SC and stress its impact on the learning process. For instance, in the study [21], it was revealed that peer support was positively correlated with students' motivation, which in turn enhanced their academic achievement. Conversely, the SC has a positive correlation with both high students' positive attitudes toward learning and students' academic achievement [22, 23].

Additional research has shown that SC not only predicts a positive state of well-being but also fosters an internal learning drive [3]. Moreover, the meta-analytic study by [24] revealed that friendly interactions among students participating in academic activities are linked to a better learning process and better outcomes. Furthermore, working memory, effortful control, and cognitive outcomes are examples of executive processes that are linked to peer competence [25].

Although the empirical data above point to a positive correlation between SC and engagement, further study is necessary to determine how this aspect connects to the many components of engagement (BE, CE, EE, and AE). Conversely, it is imperative to acknowledge that interpersonal interactions with classmates hold equal significance as relationships with the teacher. To this end, students who have a good rapport with their teachers are therefore more engaged in the learning process and increase their learning motivation as well as self-esteem [26, 27]. Additionally, a positive relationship between teachers and students boosts their confidence in their capacity to learn, which in turn promotes their academic achievement and participation in the process [28]. Thus, the teacher–student relationship is a mechanism that can be used by teachers to help students engage in their learning process and equally to enhance learning outcomes.

EQ appears to be another factor that may influence student engagement. EQ reflects the degree to which students believe they are receiving equitable treatment from their teacher in terms of opportunity, feedback, and praise [20]. EQ is not a feature that just happens; teachers must work hard to make it happen. In this sense, educators can create an environment that promotes EQ by giving all students a sense of empowerment, encouraging teamwork among peers, and pushing them to take an active role in their learning pursuits [29]. Besides, for EQ to be established in the classroom, teachers have to show a keen interest in each student, give out incentives equally, and hold each student to a high standard [30].

TS reflects how accommodating, kind, and encouraging teachers are to their students [31]. The support from the teacher may be manifested either emotionally or academically. Students' impressions that their teachers have dedicated time and effort to what and how much they have learned are highlighted by their academic assistance. In contrast, teachers' emotional support refers to students' perceptions of teachers' compassion, respect, and affection throughout the learning process [32]. Support from teachers shows up in the form of encouraging words, conversation, constructive feedback, and attention to students' needs [2]. By doing this, the instructor creates a pleasant learning environment, encourages intrinsic motivation in the students, and builds self-efficacy in them—all of which act as powerful barriers against the detrimental impacts of stress on the students [33].

The TS plays a crucial role in fostering educational EQ as well as student engagement in the classroom and achievement [34]. Moreover, good relationships between teachers and students create EQ and are especially beneficial for young people who are being victimized [17]. They also promote lessening the detrimental impact

of poor attainment [34]. Conversely, unsatisfactory student–teacher relationships and interactions may increase stress, despair, and unfavorable feelings toward learning, which can leave students feeling frustrated and helpless [35]. Thus, TS is an important component of EQ, and it can be risky for children who show lower learning outcomes if there is a lack of it [36]. Besides, research indicates that students feel safer and more equitable when they have strong support from both teachers and peers [36]. Moreover, TS was revealed as protective when there was little peer support [17]. Thus, the TS outweighs that of students and has to be developed first for student engagement to happen. While TS describes the steps a teacher takes to help and mentor students one-on-one, EQ refers to a more comprehensive idea of guaranteeing that all students, regardless of their needs or background, have fair access to learning opportunities [4].

TAS is another psychological need to which a response must be given for the effective learning process to proceed. Teachers usually employ one of two motivational styles while instructing students: one that encourages student autonomy and the other that is quite controlling [33]. Research results show that an autonomous learning style is linked to highly motivated students, successful learning engagement, and learning outcomes [37]. The controlling style, on the other hand, produces low outcomes as it is associated with decreased motivation and superficial learning, which results in low academic achievement [16]. As a result, teachers need to adopt a motivational approach that values student autonomy instead of a controlling one. By doing this, they will help students meet fundamental psychological needs and establish an environment that motivates them to be engaged and strive for excellence.

TAS is a behavior that is learned by the teacher and focuses on assisting learners in feeling in charge of their learning, which stands for the internal locus of control. It entails setting up a classroom environment where students are comfortable asking questions, pursuing interests, and expressing their opinions [37]. TAS is an interpersonal tone of understanding and support, where teachers are patient and sympathetic, encourage students to satisfy their needs, give reasons for their requests, use educational language, and recognize and accept negative affective expressions [3]. Studies have demonstrated the benefits of teachers acting in a way that promotes autonomy support. For instance, the study revealed that students' internal motivational resources are strengthened and developed when they have autonomy [37], and it offers choices and structure as well [38]. Other studies have proved that TAS improves students' self-efficacy and their attention and executive ability [39]. This, in turn, enhances academic performance [40–42]. Teachers who support students' autonomy help them feel more supported and encouraged, which helps to build positive teacher–student relationships [43].

Additionally, students' learning outcomes and processes may be impacted by teachers' provision of varying degrees of autonomy support [44, 45]. Moreover, TAS makes students feel more supported and encouraged, which promotes a deep learning style [43] and boosts learners' confidence in their own abilities [40]. Several studies have shown that to give autonomy-supportive instruction, a teacher must avoid uttering answers, be responsive, respond appropriately to students' inquiries, spend more time listening to students, permit students to work on their own, give them a chance to work on activities that they find interesting, and offer a meaningful rationale for learning certain material [14, 46, 47]. The research reveals that once these autonomy-supportive teaching behaviors are acquired during teaching practices, they persist [47]. While there are many ways in which the TAS can be connected to various students' aspects of learning outcomes, this study specifically explored its links with student engagement.

Despite the importance of SC, EQ, TS, and TAS, recent research has shown that few teachers create favorable conditions for student relatedness and actively involve students in the teaching and learning activities [48]. Besides, very few teachers link their teaching practice with justice [49]. Moreover, other teachers adopt a controlling style while teaching [33]. Thus, it is important to raise teachers' awareness.

Few previous studies have shown a relationship between student engagement and gender, and the available ones have yielded conflicting results. For instance, a study [50] revealed that female students showed a tendency toward lower engagement. Other researchers found that females were more engaged than boys [51, 52]. However, in the study by [53] and that of [54], no gender difference in student engagement was found.

Regarding students' reported perceived SC, EQ, and TS in the classroom, various studies have shown that males and females had different perceptions. For example, the study [55] indicated that females scored significantly higher than males on SC and TS, while no significant difference was observed on EQ. However, in the study [23], no gender differences were detected in students' perceptions of SC and TS in the classroom. Similarly, in the study by [56], no significant differences in boys' and girls' perceptions of SC and TS were detected, but boys and girls differed significantly in their perception of EQ, with females reporting higher scores.

On the other hand, the literature makes clear that boys and girls receive different treatment in the classroom. For example, the academic relationship between teachers and students is typically skewed toward males, who typically receive more teachers' questions [40]. The authors further argued that male students' inquiries receive more consideration than those made by female students. As a result, boys engage in classes more, receive more attention from teachers, and feel more in charge of the subject than girls.

According to data from other studies looking at gender disparities in the general classroom setting, female students expressed greater levels of support for teacher autonomy than their male counterparts [57]. On the contrary, the study conducted by [40] revealed no significant gender difference in the perceived TAS. Although there is a dearth of more recent research on gender disparities in these classroom learning environment characteristics, it might be essential to comprehend current trends in how boys and girls experience their classroom learning environment in terms of SC, TS, EQ, and TAS, especially in developing countries like Rwanda, where most teachers are still relying on traditional teaching methods, which have been attributed to low students' learning outcomes. To achieve this, the study was driven by the following research questions:

1) Are there any significant correlations between students' perceived SC, EQ, TS, TAS, and engagement variables?
2) Do male students differ significantly from female students in their self-reported perceived SC, EQ, TS, TAS, and engagement variables?
3) To what degree do the independent variables of TS, SC, EQ, and TAS predict the dependent variables of student engagement (BE, CE, EE, and AE)?

2.1. Theoretical framework

This study was anchored in SDT. According to SDT, students are typified by three fundamental needs: belongingness, competence, and autonomy [3]. According to SDT, in addition to basic needs like food and shelter, an individual's ability, relatedness, and autonomy are crucial mental qualities that are necessary for them

to thrive [3]. Students who have these needs satisfied are probably highly motivated, inquisitive, active, and involved in the learning process, all of which result in better functioning of the students in the classroom [3]. Thus, how teachers fulfill these needs affects their success, motivation, engagement, and prosperity.

SDT holds that the social circumstances that uphold an individual's sense of competence, relatedness, and autonomy encourage the best kinds of engagement in activities [44]. In this way, a teacher who supports students' autonomy in the classroom would care for and satisfy their basic psychological needs (autonomy, competence, and relatedness), all of which are related to how engaged students are in the classroom. In addition, SDT explains that autonomy support leads to important psychological benefits for the student because it promotes the satisfaction of the needs for competence, relatedness, and especially autonomy [11].

SDT defines the need for competence as having a sense of worth, ability, and accomplishment in one's interactions with others within a social context. On the other hand, the belief in one's abilities and the desire to interact with the environment in a way that yields desired results are referred to as the need for competence [3]. The need for belongingness to an individual or a specific group is known as the requirement of relatedness, and it is satisfied only when relationships are autonomous and genuine to oneself and others. The need for autonomy describes the need to feel in charge of one's actions, to believe that one has some degree of control over one's beliefs and behaviors, and to feel that one's actions and values are consistent [3].

In the learning process, SDT is relevant as it suggests that when learners meet their psychological needs for relatedness, competence, and autonomy, students are more engaged and perform better [3]. Besides, caring relationships meet the basic need for feeling connected to others. When this relationship is fulfilled in a particular setting, like a classroom, students are inspired to engage in academic work, persevere in the face of setbacks, and find innovative solutions to the problems that arise in that setting. Therefore, SDT is the foundation of this study, which investigated how the psychological aspects of students (BE, CE, EE, and AE) are influenced by the learning environment aspects (SC, TS, EQ, TAS), and it supports and provides an explanation of such investigation.

3. Research Methodology

3.1. Research design

This study utilized a correlational survey design, which involves quantifying the degree of correlation between naturally occurring variables without attempting to change them [58]. The design was adopted since the study intended to predict the value of SC, EQ, TS, and TAS as the independent variables on student engagement (BE, CE, EE, and AE) as the dependent variable. The survey provides data on two or more variables' states or current events. In the current study, a questionnaire-based survey was used to explain how students perceived SC, TS, EQ, TAS, and engagement. This research design was used to examine the relationship between the independent variables (SC, TS, EQ, TAS) and the dependent variables (BE, CE, EE, and AE) to determine how the independent variables predict the dependent variables.

3.2. Participants

The study was conducted in Rwanda's Nyamagabe district in boarding secondary schools. The schools that took part in this study were chosen using a purposive sample technique. This was done based on equivalence (school with relatively good standards in terms of infrastructure, teaching resources, and the presence of qualified and experienced teachers with bachelor's degrees in education or with postgraduate diplomas and with a minimum of experience of five years in teaching), type of school (boarding), school ownership (public or government aided, students' enrollment (lower secondary school), and gender composition. Considering the above sampling criteria, four out of the seven coeducational schools were selected. The study sample consisted of 305 SS2 students attending four boarding schools in the district. There were 150 (49.2%) boys and 155 (50.8%) girls. Their mean age was 13.52 (SD = 0.77).

3.3. Instruments

In this study, data were collected using the Likert scale questionnaire. According to Creswell [58], the Likert scale was developed in 1932 by Rensis Likert. It uses a psychometric response scale to measure attitudes, opinions, or beliefs by asking respondents to indicate their level of agreement or disagreement with a series of statements. It encourages choice rather than the option to add different responses. While variations exist, common Likert scales use 5 or 7 points, with the midpoint representing neutrality. As responses are fixed, the data should be quicker and easier to analyze than the information from open-ended, qualitative survey questions. Some of its advantages include the ease of analysis of collected data and flexibility in measuring a range of opinions, behaviors, and attitudes. However, the Likert scale has some limitations, including forced and unequal responses as well as less information. Referring to the purpose of the study, the Likert scale was adopted to quantify students' perceptions of the independent and dependent variables, making them easier to analyze statistically and compare across students' genders. In this study, students' perceptions of SC, EQ, and TS were measured using three subscales from the What Is Happening In this Class (WIHIC) questionnaire [59]. The SC subscale measures the degree of friendliness and mutual support among students. The subscale for TS explores the degree to which students perceive their teacher's assistance, friendship, and genuine interest in them. The EQ subscale measures how fairly a teacher distributes praise, asks questions, and allows students to participate in class discussions. Each of these WIHIC subscales comprises eight items, with a rating scale ranging from 1 to 5, where 1 = almost never and 5 = almost always, on which students reported how frequently the statement occurred in their classes.

To measure students' perceived TAS, the study used the short form of the Learning Climate Questionnaire [60]. This questionnaire consists of 15 items answered on a 5-point Likert-type scale ranging from 1 = strongly disagree to 5 = strongly agree, with an intermediate score of 3 (neutral). To assess student engagement, the behavioral, cognitive, emotional, and agentic engagement subscales of the student engagement questionnaire developed by [61] were used. The BE (five items) subscale evaluated students' participation in the learning activities and emphasis on task attention. The CE (four items) subscale assessed the students' utilization of advanced learning strategies and meta-cognitive self-learning techniques, including planning and monitoring. The EE (five items) subscale assessed students' positive reactions and energized emotional states such as interest. The AE (seven items) subscale assessed students' contribution to and involvement in the lesson. Every subscale item was scored using a 5-point Likert scale, where 1 denoted "strongly disagree" and 5 denoted "strongly agree." Additional questions concerning a student's gender and school code were added to the instruments.

Table 1
Dimensions and examples of items in the study scales

Scales	Items	Cronbach α	Example
Student Cohesiveness	8	0.95	I work well with other class members
Teacher Support	8	0.97	My teacher is interested in my problems
Equity	8	0.89	I am treated the same as other students in this class
Perceived Autonomy Support	15	0.74	My teacher encourages me to ask questions
Behavioral Engagement	5	0.90	I try hard to do well in this class
Cognitive Engagement	4	0.74	When doing work for this class, I try to relate what I'm learning to what I already know
Emotional Engagement	5	0.79	When I am in this class, I feel good
Agentic Engagement	7	0.88	During class, I ask questions to help me learn

Despite having been validated in many countries with diverse linguistic and educational systems, the scale items were submitted to the experts in measurement and evaluation from the University of Rwanda-College of Education measurement for face and content validation. Following their advice, the appropriate corrections and adjustments were made. In addition, a pilot test of the instruments was also conducted on 50 students from a coeducational school that was not included in the main study but had characteristics similar to those of the sampled schools. This was done to eliminate ambiguity, to guarantee that the items are valid and trustworthy, and to determine whether respondents could understand the instructions on the instruments. The number of items, Cronbach's alpha (α) coefficient reliabilities, and the example of an item for each scale dimension are presented in Table 1.

In the current study, the value of Cronbach's α (alpha) reliability for the study subscales varied from 0.74 to 0.97, which indicates that the subscales were reliable and had an acceptable internal consistency [58, 62].

3.4. Data collection

Before starting the data collection process, the study initially received approval from the Nyamagabe district education officer and the school administration, respectively, to approach the chosen schools and students. After that, we went to the schools and gave information about the study's relevance, goal, and data collection and usage procedure to the participants as well as school administrators. The sampled participants were made aware of their rights to voluntary participation, informed consent, and confidentiality. Selected students, guided by the researchers, completed the surveys during regular school hours. They were given 2 hours to complete the research instruments. The student participants were free to ask any questions they had about the study both before and during its administration. The data gathered was private, anonymous, and used exclusively for study and research purposes.

3.5. Data analysis

The Statistical Package for the Social Sciences (SPSS) version 21.0 was used to analyze the data. Statistical analysis included descriptive statistics (mean and SD), correlation, and regression analysis. Cohen's criteria were used to interpret the strength of the observed correlations [63]. To examine the variations in the variables by gender, the multivariate analysis of variance (MANOVA) was computed.

For the interaction effects, effect sizes (partial eta squared coefficient) were determined; $\eta^2 = 0.01$ denotes a little effect, $\eta^2 = 0.06$ denotes a medium effect, and $\eta^2 = 0.14$ denotes a big effect [63]. Multiple regression analysis was used to examine the potential effects of the independent variables on each dependent variable. The standardized computation of regression coefficients (β) was done and examined to find out the independent variables that exclusively and significantly contributed to the change in the dependent variable. In regression analysis, the effect size of the predictors is given by the beta (β) loadings. In interpreting the effect size, the guidance indicated by [64] was followed. For all inferential statistical analyses, a significance threshold of 0.05 was applied. The choice of the analysis of variance, Pearson correlations, and regression analyses was in line with Gail and Anthony [65] that parametric tests are to be used when analyzing Likert scale responses.

4. Findings

4.1. Correlations

The study's variables' descriptive statistics and intercorrelations are presented in Table 2. By analyzing the skewness (−0.10 to −0.030) and kurtosis (−0.590 to 0.243) values, Table 2 demonstrates that the study data were close to a normal distribution.

According to the means of variables, the highest score was that of SC (M = 3.94), and the lowest mean score was that of EQ (M = 3.72). The Pearson correlation results indicate that all study variables show statistically significant associations among themselves, although the association can be considered small correlation ($r = 0.136$ to $r = 0.294$), moderate ($r = 0.308$ to $r = 0.493$), and strong ($r = 0.583$ to $r = 0.750$). This Pearson's r correlation indicates some cohesion among the study variables [64].

To analyze the differences in variables by gender, the MANOVA was calculated. To achieve this, student gender was entered as the independent variable and the SC, TS, EQ, TAS, BE, CE, EE, and AE as dependent variables (Table 3).

4.2. MANOVAs

According to the MANOVA results, outlined in Table 3, a significant difference between boys and girls based on the combined dependent variables ($F = 2.240$, $p \leq 0.001$, Wilks' lambda = 0.943) was observed. The results in Table 3 indicate a lack of significant difference in the mean scores of the three independent variables (SC, TS, and EQ) based on gender. In contrast, the mean of the fourth independent variable (TAS) for girls (M = 4.04, SD = 0.92) was greater than the mean for boys (M = 3.81, SD = 0.99). Statistical

Table 2
Descriptive statistics and Pearson *r* correlation coefficients

	M	SD	Skew	Kurt	1	2	3	4	5	6	7	8
1. SC	3.94	0.77	0.01	–1.14	1							
2. TS	3.86	0.85	0.19	–1.48	0.750**	1						
3. EQ	3.72	1.47	–1.32	1.12	0.385**	0.493**	1					
4. TAS	3.93	0.96	–0.10	–1.48	0.590**	0.646**	0.518**	1				
5. BE	4.01	0.69	–0.26	–0.15	0.320**	0.254**	0.263**	0.263**	1			
6. CE	4.16	0.84	–0.28	–1.31	0.294**	0.320**	0.178**	0.308**	0.136*	1		
7. EE	3.37	0.92	0.03	–0.87	0.249**	0.291**	0.304**	0.316**	0.197**	0.444**	1	
8. AE	3.33	0.57	–0.19	–0.65	0.699**	0.746**	0.415**	0.583**	0.217**	0.237**	0.291**	1

Note: * Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Table 3
MANOVA results with means and standard deviations for the variables by gender

		M	SD	Mean square	F	*p*-value	Partial eta^2
SC	Boys	3.89	0.76				
	Girls	3.99	0.79	0.766	1.266	0.261	0.004
TS	Boys	3.82	0.84				
	Girls	3.90	0.87	0.525	0.716	0.398	0.002
EQ	Boys	3.78	1.37	0.802	0.368	0.544	0.001
	Girls	3.67	1.57				
TAS	Boys	3.81	0.99	4.097	4.442	0.036	0.014
	Girls	4.04	0.92				
BE	Boys	3.90	0.58	3.554	7.617	0.006	0.025
	Girls	4.12	0.76				
CE	Boys	4.10	0.83	1.207	1.668	0.195	0.006
	Girls	4.22	0.85				
EE	Boys	3.38	0.97	0.077	0.090	0.764	0.000
	Girls	3.35	0.87				
AE	Boys	3.31	0.59	0.131	0.391	0.532	0.001
	Girls	3.35	0.56				

analysis revealed a significant difference ($F = 4.442$, $p = 0.036$); however, partial eta^2 ($\eta^2 = 0.014$) indicates a small effect.

4.3. Regressions

To find out if gender, student cohesion, EQ, TS, and TAS predicted behavioral, cognitive, emotional, and agentic engagement, a series of multiple regression analyses were performed.

4.3.1. Predicting behavioral engagement

To figure out how SC, TS, EQ, and TAS predict student BE, a multiple regression analysis was undertaken (Table 4).

The multiple regression model results, as outlined in Table 4, show that the model was significant ($F = 10.443$, $p < 0.05$). This model accounts for approximately 14.9% of the variation in students' BE (adjusted $R^2 = 0.149$). In addition, Table 4 shows that student BE was statistically significantly predicted by student gender ($\beta = 0.144$, $p < 0.05$), SC ($\beta = 0.271$, $p < 0.05$), and EQ ($\beta = 0.177$, $p < 0.05$). The findings imply that as peer support and justice increase, student BE in the learning process increases regardless of gender.

4.3.2. Predicting cognitive engagement

A series of multiple regression analyses were conducted to find out how gender, student cohesion, EQ, TS, and TAS predicted student CE (Table 5).

The multiple regression model results in Table 5 show that the model was significant ($F = 8.537$, $p < 0.05$). This model accounts for approximately 12.5% of the variation in students' CE (adjusted $R^2 = 0.125$). In addition, Table 5 shows that student CE was statistically significantly predicted by perceived autonomous support ($\beta = 0.156$, $p < 0.001$). The findings imply that students' CE increased with the amount of perceived autonomy support.

4.3.3. Predicting emotional engagement

Multiple regression analysis was used to examine how gender, SC, EQ, TS, and TAS predicted EE (Table 6).

Table 4
Prediction of student behavioral engagement

	Unstandardized coefficients			*t*	*p*
	B	SE	Standardized coefficients β		
Student behavioral engagement (R^2 = 0.149; F = 10.443, p = 0.000)					
Constant	2.564	0.220		11.653	0.000
Gender	0.199	0.075	0.144	2.662	0.008
SC	0.241	0.073	0.271	3.285	0.001
TS	–0.055	0.072	–0.068	–0.760	0.448
EQ	0.083	0.030	0.177	2.741	0.006
TAS	0.027	0.054	0.038	0.498	0.619

Table 5
Prediction of student cognitive engagement

	Unstandardized coefficients			*t*	*P*
	B	SE	Standardized coefficients β		
Student cognitive engagement (R^2 = 0.125; F = 8.537, p = 0.000)					
Constant	2.573	0.274		9.409	0.000
Gender	0.071	0.093	0.042	0.767	0.444
SC	0.089	0.091	0.082	0.981	0.327
TS	0.161	0.090	0.162	1.794	0.074
EQ	–0.007	0.038	–0.013	–0.195	0.846
TAS	0.137	0.067	0.156	2.031	0.043

Table 6
Prediction of student emotional engagement

	Unstandardized coefficients			*t*	*P*
	B	SE	Standardized coefficients β		
Student emotional engagement (R^2 = 0.134; F = 9.247, p = 0.000)					
Constant	1.991	0.297		6.709	0.000
Gender	–0.069	0.101	–0.037	–0.681	0.496
SC	0.032	0.099	0.027	0.320	0.749
TS	0.091	0.097	0.084	0.937	0.350
EQ	0.104	0.041	0.165	2.531	0.012
TAS	0.158	0.073	0.165	2.162	0.031

The multiple regression model results, as outlined in Table 6, show that the model was significant (F = 9.247, p < 0.05). This model accounts for approximately 13.4% of the variation in students' BE (adjusted R^2 = 0.134). In addition, Table 6 shows that student EE was statistically significantly predicted by EQ (β = 0.165, p < 0.05) and perceived autonomy support (β = 0.165, p < 0.05). The results suggest that student EE in the learning process increases with TS for autonomy and fairness.

4.3.4. Predicting agentic engagement

To find out how gender, SC, EQ, TS, and TAS predicted student AE, a multiple regression model was used (Table 7).

The multiple regression model results, as outlined in Table 7, show that the model was highly significant (F = 93.457, p < 0.05). This model accounts for approximately 61.0% of the variation in students' AE (adjusted R^2 = 0.610). In addition, Table 7 shows that student AE was statistically significantly predicted by SC (β = 0.291, p < 0.05) and TS (β = 0.442, p < 0.05) and perceived autonomy support (β = 0.114, p < 0.05). The findings imply that as peer and teacher support and autonomy support from the teacher increase, student AE in the learning process increases.

5. Discussion

This study aimed to explore the predictive role of SC, TS, EQ, and TAS in student engagement. Overall, the findings indicate that the engagement students display is positively associated with SC, TS, EQ, and TAS. This is in line with previous study findings [2, 53]. Thus, in classes where students help one another and teachers are attentive to their students, treat them equally, and give them autonomy support, the students' potential engagement opportunities are increased. Specifically, the obtained results showed that student AE was strongly related to SC, TS, and TAS. This shows that the way the teacher and peer students behave in the classroom during the teaching and learning process, for example, helping one another and giving students autonomy, is important as it can enhance students' active participation in class activities. Research has shown that for students to be engaged in learning, they need a

Table 7
Prediction of student agentic engagement

	Unstandardized coefficients			*t*	*p*
	B	SE	Standardized coefficients β		
Student agentic engagement ($R^2 = 0.610$; $F = 93.457$, $p = 0.000$)					
Constant	1.046	0.125		8.378	0.000
Gender	–0.020	0.042	–0.017	–0.469	0.639
SC	0.217	0.042	0.291	5.211	0.000
TS	0.299	0.041	0.442	7.316	0.000
EQ	0.010	0.017	0.025	0.578	0.564
TAS	0.068	0.031	0.114	2.226	0.027

supportive environment that acknowledges their competence and autonomy and fosters harmonious relationships [53]. Besides, autonomously driven students demonstrate the qualities of purposeful learning—intrinsic desire, effort, and a sense of control over their learning process, which are hallmarks of intentional learning [4]. This means that giving students autonomy enhances their potential for engagement and may lead to better learning results since teachers are aware of their needs and are sympathetic to them. The results of this study are in line with earlier research that demonstrated that adaptive outcomes like the usage of high learning strategies were linked to teacher's encouragement and support [53], deep learning and self-efficacy [66], low emotional and behavioral issues [67], and high self-regulated learning [68]. This means that giving students autonomy enhances their potential for engagement and may lead to better learning results since teachers are aware of their needs and are sympathetic to them.

Additionally, the study's findings indicate a lack of significant difference between boys and girls in their perceptions of SC, TS, and EQ. This concurs with the findings of [6, 56], who found no significant difference between boys and girls in their perceptions of the SC, TS, and EQ. This finding implies that in a classroom learning environment where students receive the support of teachers and classmates and are equally treated, such an environment ensures gender equality. This finding disagrees with the findings of [52], who discovered a gender disparity in students' perceptions of TS, with males reporting less support from their teachers. Regarding the TAS, a statistically significant difference was obtained, with girls showing higher mean scores. The finding concurs with that of [52], who found a statistically significant difference in student-perceived autonomy support, but contradicts that of [6]. Some explanations for these gender disparities can be found in earlier literature. Empirical evidence has shown, for example, that teachers have closer ties with female students than they do with male students and have more conflictual interactions with male students [69]. Therefore, males' lower reports of their teachers' autonomy support may be explained by this teacher's gender-specific behavior tendency in the classroom.

For the engagement variables, no statistically significant gender differences in CE, EE, and AE were found. These findings are in line with the previous study of [6]. However, the findings revealed statistically significant differences between boys and girls on BE in favor of girls. This finding confirms previous studies showing the gender gaps in BE, with girls having higher scores [70]. A related explanation for this finding may be that, nowadays, due to sensitization and mindset change, female students have started participating actively in class activities, attending regular classes, and making an effort at learning. This is supported by the [70] argument that different from the past decades, today's female students work and try harder and perform better academically than males do.

Furthermore, the results of the multiple regression analysis showed that gender, SC, and EQ significantly predicted student BE. This finding is consistent with [2, 52]. The implication is that in a class where students manifest mutual support and believe that their teachers treat them equally without exhibiting any sex discrimination, those students are more likely to be actively engaged in the learning process. This finding reflects that supportive student–student relationships and EQ are crucial in the teaching and learning process as they encourage student engagement in learning. This also confirms the assumption [6] that SC and EQ are crucial factors for effective engagement in learning. Therefore, teachers must create an environment where students feel liked by their peers, peer cooperation, and teachers' EQ for effective learning.

Also, the results showed that TAS significantly predicted student CE. A similar finding is found in the previous related literature [2]. The tentative explanation of this finding is that in classrooms where students perceive their teachers as more interested in them and help them when they have problems with learning, they tend to be more cognitively engaged in learning than do students who perceive that their teachers offer them low support. Moreover, the study results revealed that EQ significantly predicted EE. Previous studies such as [2, 6] found similar findings that EQ significantly predicted students' EE. Besides, it was found that EE was significantly predicted by TAS. This finding goes hand in hand with the findings of [2, 6, 26, 71], who all found that TAS significantly predicted student EE. The implication for this is that when TS and fairness rise, student EE in learning increases.

Finally, the results showed that SC, TS, and TAS statistically and significantly predicted students' AE. This gains support from the findings of [70, 72], who, in different studies and contexts, found that SC, TS, and TAS are the key determinants of student AE. In the same way, the study [30] found that SC and TS predicted statistically significant AE. The results of this study validate the significance of the students' friendship and the teacher's autonomy-promoting conduct for students' active participation in the learning process. The implication is that when students help and support each other and receive the teacher's support and when teachers encourage students' autonomy, students are more likely to actively use learning strategies and try to enrich their learning experience rather than just accepting it as a given. This supports the idea put forth by [37] that students are inspired to be proactive and take charge of their education when teachers exhibit autonomy-supportive behavior. This is because teachers' autonomy support increases students' autonomous motivation and involvement in learning activities and decreases their anxiety levels [73]. In addition, the research

highlights that a teacher's autonomy enhances students' enjoyment and increases a supportive class and students' prosocial behavior [74, 75]. All of these factors encourage students' active participation in the learning process [4]. The findings reiterate the importance of learner-centered teaching strategies in the fulfillment of students' psychological needs that teacher-centered teaching methods fail to meet.

6. Study Limitations and Future Research Directions

Even though the present study provides relevant results and a noteworthy contribution, its implications should be carefully considered, taking into account certain limitations. The current study specifically examined structural classroom factors (SC, TS, EQ, and TAS) to explain student engagement in learning. However, it is crucial for future research to consider other variables such as teacher counseling, mentoring, and feedback.

Additionally, this study used self-report questionnaires to collect all data on student engagement where students themselves evaluated their level of engagement in its various aspects, which may not be sufficient to capture the complexity of real responses due to its central tendency, acquiescence, response style differences, and social desirability bias, among others, in the teaching and learning process. Therefore, to obtain more objective data, further studies should explore student engagement using additional methodologies such as interviews with teachers, focus group discussions, or observational or teacher-reported engagement measures. From the study findings, it is clear that the study has a considerable unexplained variance in student engagement. This suggests the existence of other important predicting variables that need to be incorporated in future studies. These may include, but are not limited to, learners' socioeconomic backgrounds. The present study involved a few boarding secondary schools in the Nyamagabe district. The intention was not to generalize the outcomes of this study to the school populations but to contribute to the understanding of the implications of the analyzed variables to stimulate new research on these issues. Therefore, new studies should be conducted with larger populations to generalize the results of this study. Finally, future research should expand this study by exploring how an artificial intelligence (AI)-driven learning environment influences student engagement, particularly in fostering autonomy and personalized TS.

7. Conclusions

To sum up, the current study found significant associations between perceived SC, TS, EQ, and TAS and student engagement. Gender, SC, and EQ were significant predictors for BE, while TAS was a significant predictor for CE. Besides, EQ and TAS were significant predictors for EE. Finally, SC, TS, and TAS were significant predictors for AE. It can be inferred from the findings of this study that SC predicts both BE and AE, TAS predicts CE, EE, and AE, while EQ predicts BE and EE. Therefore, a teacher must foster and maintain a safe learning environment to promote holistic student development. Besides, the significant relationships found between SC, TS, EQ, and TAS and the four aspects of engagement emphasize how important it is to encourage student engagement in secondary education. Students therefore require justice, TS, and a sense of coherence. In addition, they must express their preferences and thoughts on the course material as well as offer suggestions for improvements. By doing this, they would be able to participate actively in their education and produce significant learning outcomes.

Recommendations

The findings offer insightful information to teachers and policymakers who are dedicated to raising student engagement and academic achievement of secondary school students. Above all, teachers have a critical role to play in fostering a conducive learning environment, which is a fundamental component of student engagement in learning. Therefore, providing opportunities for teachers' skills development and mastery can significantly contribute to teachers' capacity to enhance student engagement. Recognizing the predictive role that the SC, TS, EQ, and TAS play in different aspects of engagement, teachers should cultivate and implement engagement strategies within the classroom. Additionally, the study's findings showed that various aspects of student engagement were statistically and significantly predicted by the SC, TS, EQ, and TAS. Teachers, school administrators, policymakers, and other stakeholders in education are therefore urged by the study's findings to keep in mind that these dimensions are important for successful students' active engagement in learning. As a result, SC, TS, EQ, and TAS in the classroom setting ought to be fundamental and required principles in all the activities that teachers engage in in class. Last but not least, educators should prioritize establishing a safe, encouraging classroom atmosphere where students feel appreciated and free to express and grow their abilities. Additionally, they ought to establish a learning environment that fosters a social justice perspective and ensures that all students, regardless of gender, receive an inclusive and fair education.

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Ethical Statement

This study does not contain any studies with human or animal subjects performed by the author.

Conflicts of Interest

The author declares that he has no conflicts of interest in this work.

Data Availability Statement

The data used to support the findings of this study are available upon request to the corresponding author.

Author Contribution Statement

Emmanuel Bizimana: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Data curation, writing – original draft, Writing – review & editing, Visualization, Supervision, Project administration.

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