



School and Student Well-being: Effects on Biology Learning Engagement

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Abstract

Well-being is closely linked to prosocial behaviour and mental health. However, research on the impact of school and student well-being on student engagement—specifically in the context of learning biology at schools with varying accreditation levels—remains limited. This study aims to examine the influence of school and student well-being on student engagement in biology learning at senior high schools with A, B, and C accreditation. Using a quantitative, correlational approach, this study employs multiple linear regression analysis to interpret and statistically analyse data from a sample of 177 students. The results reveal that both school and student well-being significantly impact student engagement in biology, regardless of the school's accreditation level. This suggests that irrespective of accreditation, students' engagement is significantly enhanced when classrooms provide safe, comfortable conditions, positive social interactions, and supportive teachers. Furthermore, while schools with different accreditation levels may vary in resources, fulfilling essential well-being components, such as a caring and supportive environment, contributes to sustained student engagement. The findings of this study are intended to guide schools, teachers, and stakeholders in prioritising well-being to foster higher student engagement in classroom settings.

Keywords: School Well-Being, Student Well-Being, Student Engagement, Biology Learning

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INTRODUCTION

Well-being is a state in which an individual successfully integrates cognitive, physical, and social-emotional aspects (McLeod, 2023). This condition is shaped by social relationships and the ability to navigate psychological and environmental challenges, all within the context of realising one's potential (Salvador, 2023; Roellyanti, 2024). Well-being should be a priority in school learning and the implementation of an independent curriculum in Indonesia (Thorburn, 2020). It should also be included in the global PISA measurements (OECD, 2019). This emphasis on well-being is essential, as it promotes active student engagement in learning and reduces disengagement or laziness (Chaudhry et al., 2019; Puiu et al., 2024). Additionally, fostering well-being serves as a school initiative to help alleviate the stress and challenges students face within the school environment, including issues such as bullying (Padmambika et al., 2024).

Student engagement, meanwhile, refers to the time and effort students invest in actively participating in learning activities to achieve outcomes such as high grades, enhanced critical thinking, retention, and other academic accomplishments (Kahu, 2023; Farrukh, 2024). Students who are academically engaged adapt better to challenging situations, are more likely to take advantage of learning opportunities, produce higher quality work, and exhibit greater awareness of social rules and standards in their behaviour (Eriksen & Bru, 2023). Student engagement dapat dicapai ketika siswa memprioritaskan well being. (Hews, McNamara and Nay, 2022). The relationship between student well-being and engagement is positive and significant, with engagement serving as a crucial mediator between various support factors and psychological well-being (Chaudhry et al., 2024).

Several studies have shown that teachers play a crucial role in supporting students' well-being, particularly when teaching challenging or uncomfortable material (Deepa, 2024). Additionally, research indicates that classroom conditions significantly influence students' well-being (Carton et al., 2023). However, there has been limited investigation into the relationship between well-being in educational contexts (including student and school well-being) and student engagement in biology subjects. Biology, in particular, poses unique challenges due to the need for students to integrate complex biological concepts, making it a subject that is often perceived as difficult and, at times, uncomfortable to learn (Auffray et al., 2020). Therefore, this study aims to examine the relationship between psychological well-being (encompassing both student and school well-being) and student engagement within the context of biology education. The findings are expected to underscore the importance of the role of teachers and schools in fostering a well-being-focused environment to enhance student achievement, especially in biology. Based on these objectives, the study addresses the following questions: 1) How is the value of school well-being, student well-being, and student engagement in biology subjects in schools with accreditations A, B and C? and 2) What is the relationship between school well-being and student well-being on student engagement?

METHODS

This study employed a quantitative research approach. A Likert scale was used to measure school well-being, student well-being, and student engagement for each participant. To examine the relationship between school and student well-being and student engagement, a correlational quantitative method was applied, utilising multiple linear regression to assess the influence between the variables. Data were collected through purposive sampling, selecting participants from two schools with A accreditation, one school with B accreditation, and one school with C accreditation. The sample included more schools with A accreditation because A-accredited schools were more numerous than those with B and C accreditation.

The sample consisted of 117 twelfth-grade (XII) students from schools with A, B, and C accreditation who were enrolled in biology courses. Twelfth-grade students were selected based on the assumption that they have more biology learning experience compared to students in lower grades. The distribution of students by accreditation level and gender is provided in Table 1.

Three instruments were used in this study: (1) school well-being, (2) student well-being, and (3) student engagement. The school well-being instrument was based on Konu's (2002) framework, which assesses four indicators: having, loving, being, and health. The student well-being instrument followed the model proposed by Soutter et al. (2014) and included five indicators: cognitive, psychological, physical, social, and material well-

being. Student engagement was measured through a questionnaire grounded in Fredricks et al.'s (2004) concept of student engagement, which encompasses three indicators: behavioural engagement, emotional engagement, and cognitive engagement.

Table 1. Research Subjects by Gender from Schools with A, B, and C Accreditation

Gender	Frequency and Percentage %					
	A		B		C	
Male	40	38%	9	23%	11	40%
Female	64	62%	31	78%	22	60%

The instruments, particularly those for student well-being and student engagement, were adapted to align with the context of biology learning in the classroom. Responses to the school well-being, student well-being, and student engagement questionnaires were rated on a four-point Likert scale. The indicators of school well-being from Konu's (2002) research were developed into specific question items, as outlined in Table 2.

Table 2. School Well-Being Statement Grid

No	Indicators of School Well-Being	Statement Item
1.	School Condition (Having)	<ul style="list-style-type: none"> I am comfortable with the clean school environment, especially during biology lessons. Students who violate school rules are given sanctions
2.	Social Relationship (Loving)	<ul style="list-style-type: none"> Teachers treat students fairly during biology lessons Teachers care about students' academic and personal problems Students greet teachers when they pass each other in the school environment
3.	Self-fulfilment (Being)	<ul style="list-style-type: none"> My teacher motivates me to express my opinion during biology class. My opinion is respected in discussions and presentation tasks during biology lessons
4.	Health Status	<ul style="list-style-type: none"> The school supports health programs for students The school encourages students to maintain good health

The measurement of student well-being, based on Soutter et al. (2014) with its five indicators—cognitive, psychological, physical, social, and material—is presented in Table 3. Student engagement, as defined by Fredricks et al. (2004) with three indicators—behavioural engagement, emotional engagement, and cognitive engagement—was developed into specific question items, which are presented in Table 4.

The instrument's validity and Cronbach's alpha value were used to assess its reliability and suitability for measuring the intended constructs. This study employed the Content Validity Ratio (CVR) for validity testing. Based on the CVR formula, an instrument is considered valid if it achieves a minimum CVR value of 0.99, given that five validators participated in this study. The validity analysis results for the school well-being, student well-being, and student engagement instruments are presented in Table 5.

Table 3. Student Well-Being Statement Grid

No	Indicators of Student Well-Being	Statement Item
1.	Cognitive	<ul style="list-style-type: none"> • I enjoy learning about topics related to biology. • I like reading about subjects related to biology • I enjoy learning topics related to biology
2.	Psychological	<ul style="list-style-type: none"> • I want to get the highest score in biology subject • I see myself as an optimistic person
3.	Physical	<ul style="list-style-type: none"> • I usually exercise before going to school • I eat breakfast before going to school
4.	Social	<ul style="list-style-type: none"> • I easily make friends with anyone • My opinion is listened to during discussions in biology class • I am happy to see classmates who are active during biology class.
5.	Material	<ul style="list-style-type: none"> • I see facilities such as buildings and land for biology practice at school are sufficient.

Table 4. Student Engagement Statement Grid

No.	Indicator of Student Engagement	Statement Item
1.	Behavioural	<ul style="list-style-type: none"> • I attend the class before the lesson starts • All students are free to express their opinions during discussions on biology lesson
2.	Emotional	<ul style="list-style-type: none"> • I am eager to learn the biology material explained by the teacher • I eagerly listen to the teacher's explanation during biology class
3.	Cognitive	<ul style="list-style-type: none"> • I pay attention when studying to understand the material in biology lessons better. • I understand the biology material explained in the previous lesson • I keep doing biology assignments even though they are difficult

Table 5. Validity Analysis Using CVR

No.	Variables	Statement Item No.	Ne	CVR	Description
1.	School Well-Being	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27	5	1	Valid
2.	Student Well-Being	28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62	5	1	Valid
3.	Student Engagement	63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80	5	1	Valid

The reliability test in this study was conducted using Cronbach's Alpha with SPSS version 26. Cronbach's Alpha serves as a benchmark to assess the internal consistency or correlation among the scales within the instrument. An instrument is deemed reliable if it achieves a Cronbach's Alpha value greater than 0.70 (Jose et al., 2020). The reliability test results indicate that the instruments for school well-being, student well-being, and student engagement were reliable, as shown in Table 6.

Table 6. Instrument Reliability Results Using Cronbach Alpha

Reliability Statistics		
Variable	Cronbach's Alpha	N of Items
School Well-Being	,915	27
Student Well-Being	,875	35
Student Engagement	,797	18

To assess (1) school well-being, (2) student well-being, and (3) student engagement, respondents' answers on the respective questionnaires were rated on a 4-point Likert scale: Strongly Disagree (STS), Disagree (TS), Agree (S), and Strongly Agree (SS). The scoring for these responses was as follows: SS = 4, S = 3, TS = 2, and STS = 1. The categorisation based on these values is presented in Table 7.

Table 7. Value Categorization

Value Range	Categorisation
$X \geq (\text{hypothetical mean} + 1.0 \text{ hypothetical SD})$	High
$(\text{hypothetical mean} - 1.0 \text{ hypothetical SD}) \leq X < (\text{hypothetical mean} + 1.0 \text{ hypothetical SD})$	Medium
$X \leq (\text{hypothetical mean} - 1.0 \text{ hypothetical SD})$	Low

(Azwar, 2012).

To examine the relationship between school well-being and student well-being on student engagement in biology learning, multiple linear regression analysis was conducted using SPSS version 26.

RESULTS & DISCUSSION

Data on school well-being, student well-being, and student engagement in biology subjects are presented in Table 8.

Based on Table 8, it was found that the school well-being of high schools in South Sumatra, as perceived by students, was generally categorised as moderate (74%), with only 14% classified as high. This suggests that students felt relatively comfortable within the school environment, meeting basic needs such as physical and emotional support—particularly related to the “having” and “loving” indicators—during biology classes despite the overall moderate categorisation. Students tend to respond more positively to learning demands when they perceive their school as fulfilling their basic needs and providing an enjoyable environment (Collie, 2022)

Student well-being variable: 75% (132 students) were classified as moderate, while 14% (25 students) were classified as high in biology learning. This indicates that a small group of students felt positive about teachers' interpersonal behaviour and recognised their social roles in the classroom. Positive teacher-student communication can enhance

understanding of the subject matter and foster a more effective learning process, resulting in positive feelings when students actively engage in learning activities. This aligns with (Markus, Rieser and Schwab, 2022) findings that social roles can significantly impact student well-being; students with higher well-being often have clearer social roles, which can guide them in learning activities and improve their overall well-being.

Table 8. Category of *School Well-Being, Student Well-Being, Student Engagement*

Variables	Value Range	Category	Percentage
School Well-Being	$X \leq 3$	Low	12%
	$3 \leq X < 4$	Medium	74%
	$X \geq 4$	High	14%
Student Well-Being	$X \leq 3$	Low	11%
	$3 \leq X < 3$	Medium	75%
	$X \geq 3$	High	14%
Student Engagement	$X \leq 3$	Low	10%
	$3 \leq X < 3$	Medium	73%
	$X \geq 3$	High	17%

Regarding student engagement in biology class, 73% (129 students) had a moderate level of engagement, while 17% (30 students) demonstrated high engagement. This suggests that the latter group was actively involved in learning activities, completing tasks assigned by the teacher and demonstrating a good understanding of biology content. In contrast, the majority attended classes but did not necessarily engage actively. This finding is consistent with studies by Nuralita et al. (2021) and Lam et al. (2023), which found that students with high engagement levels exhibited regular attendance, active participation in discussions, strong dedication to learning activities, and a high interest in learning materials. The variation in school well-being, student well-being, and student engagement across schools with A, B, and C accreditation levels is illustrated in Figure 1.

Based on Figure 1. data on school well-being in schools with A, B, and C accreditation indicate that the "loving" indicator scored higher than other indicators across all accreditation levels. However, the differences were not statistically significant. This may be attributed to the positive emotional relationships (loving) between students and teachers or among peers, which can enhance students' motivation and desire to engage in learning, particularly in biology actively. Research by Islam et al. (2024) supports this, demonstrating that academic leadership grounded in love and compassion positively influences well-being and encourages positive student behaviour. Similarly, Campbell and Stramondo (2017) highlight that peer, parental, and teacher support, along with a supportive school environment, collectively enhance school well-being.

Improving students' school well-being in the classroom relies on strong social support from all school stakeholders. Interviews with students revealed that, without support from friends and teachers, their interest in learning diminishes. This support includes partners for discussion and help in understanding challenging material. Additionally, strong emotional connections between students and teachers foster a sense of comfort and satisfaction, thereby enhancing school well-being (Ho-tang et al., 2016; Aulia, 2018; Jiang et al., 2022).

Based on Figure 1.b, the student well-being variable in A-accredited schools showed higher scores in cognitive indicators compared to other well-being indicators. Cognitive indicators refer to the skills and knowledge foundation students require to engage effectively in the school environment, including academic proficiency, collaboration skills,

problem-solving abilities, and a sense of mastery over subjects. These aspects foster behaviours that encourage knowledge acquisition and skill development, equipping students to tackle complex ideas and challenges (Soutter et al., 2014; Asri et al., 2024). In B-accredited schools, physical well-being was more prominent, while in C-accredited schools, psychological well-being was the highest indicator. Psychological well-being relates to students' self-evaluation, engagement with school, future goals, and their motivation to participate actively in learning, particularly in biology (Soutter et al., 2014).

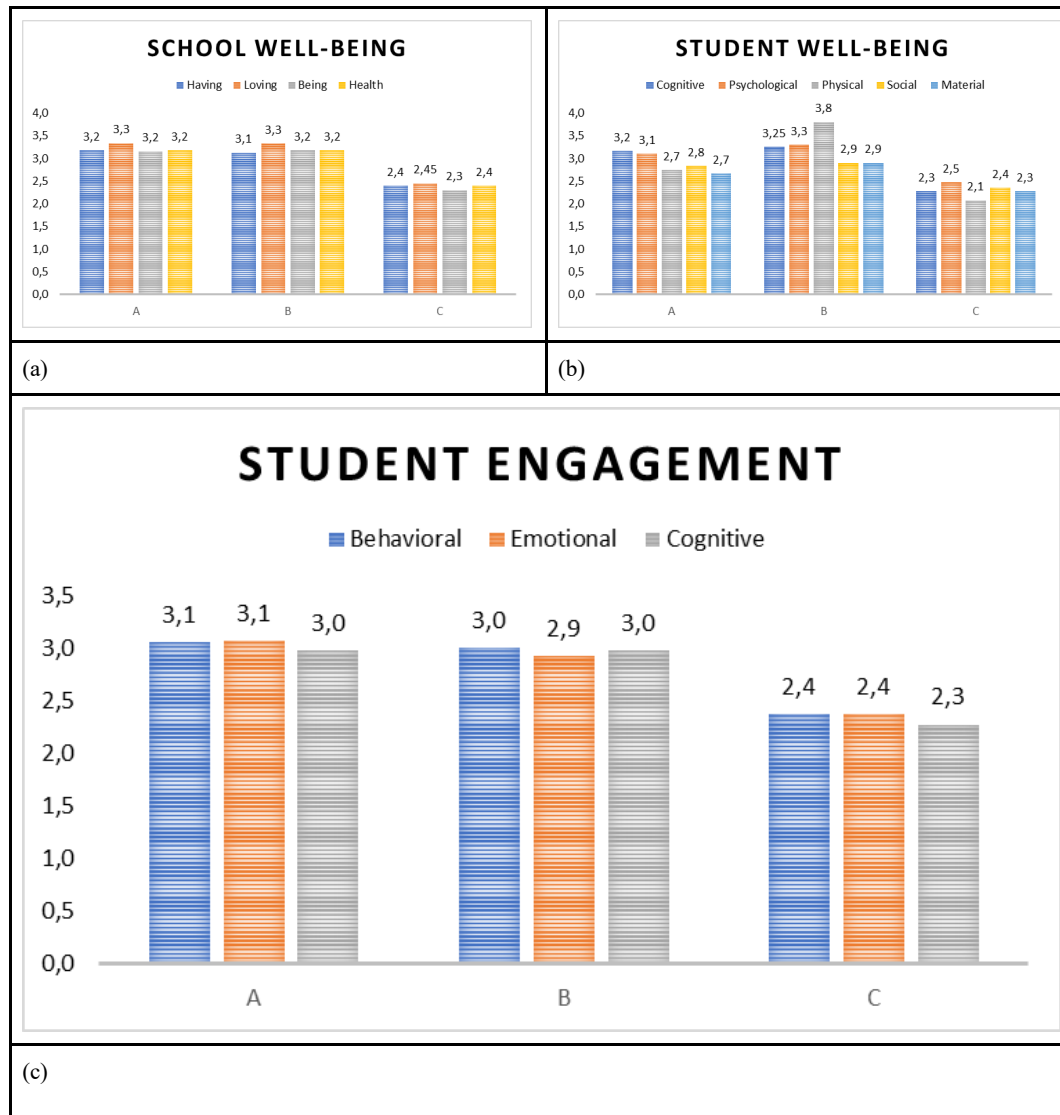


Figure 1. Variation of School Well-being, Student Well-being, and Student Engagement in Schools with A, B, and C Accreditation

Personal interviews with students supported these findings, with students indicating that biology teachers provided opportunities for debate and encouraged questions. This aligns with findings by Douwes et al. (2023), who noted that students' perceptions of well-being encompass a wide range of factors beyond academic performance. Students see their well-being as influenced by various interacting components, including relationships and support from peers, family, instructors, and resources. This study suggests that students distinguish between personal well-being and

academic well-being, valuing both equally in their overall learning experience, consistent with Suwarti et al. (2022), who observed that student well-being is tied to satisfaction with classroom experiences and positive relationships with teachers and peers.

According to Figure 1.c, student engagement in A- and B-accredited high schools showed balanced scores across all engagement indicators—behavioural, emotional, and cognitive—in biology classes. This implies that students were actively involved in academic activities, such as attending classes, participating in learning activities, following rules, completing assignments, and exhibiting emotional engagement, including enthusiasm, happiness, and satisfaction with academic tasks. They actively engaged in class discussions, assessed their learning, performed well on tests, and enjoyed taking on new challenges. However, C-accredited schools displayed lower levels of student engagement. Studies indicate that when students perceive their school environment as positive and supportive, they tend to be more engaged behaviorally, emotionally, and cognitively (Wayan, 2022). Furthermore, practical activities significantly impact student engagement in science subjects like biology. Joshi (2023) found that science instruction without practical components diminishes students' interest and engagement, reducing their participation in learning.

The relationship between school well-being and student well-being on student engagement

The relationship between the variables—X (school well-being and student well-being) and Y (student engagement)—is presented in Tables 9, 10, and 11, showing the results of multiple linear regression analyses for schools with A, B, and C accreditation. This analysis aims to determine the direction of the relationship between the independent and dependent variables, indicating whether each independent variable is positively or negatively correlated with student engagement. Additionally, it enables predictions regarding changes in the dependent variable based on increases or decreases in the independent variables.

Table 9. Multiple Regression Coefficient of An Accreditation School

<i>Model</i>	Unstandardised Coefficients	
	B	Std. Error
Constant	14.552	3.373
School Well-Being	.001	.044
Student Well-Being	.388	.041

Based on Table 9, the multiple linear regression equation for A accreditation school was obtained as follows:

$$Y = 14.552 + 0.001X_1 + 0.388X_2 + e$$

The multiple regression coefficients for school well-being and student well-being were 0.001 and 0.388, respectively. These positive coefficients indicate a positive influence of both school well-being and student well-being on student engagement levels. In other words, higher levels of school well-being and student well-being are associated with increased student engagement.

Table 10. Multiple Regression Coefficient Value of B Accreditation School

<i>Model</i>	<i>Unstandardised Coefficients</i>	
	B	Std. Error
Constant	23.966	5.754
School Well-Being	.100	.068
Student Well-Being	.192	.076

Based on Table 10, the multiple linear regression equation for B accreditation school was obtained as follows:

$$Y = 23.966 + 0.100X_1 + 0.192X_2 + e$$

The multiple regression coefficients for school well-being and student well-being were 0.100 and 0.192, respectively. These positive coefficients indicate a positive influence of both school well-being and student well-being on student engagement levels. In other words, as school well-being and student well-being increase, student engagement levels also tend to rise.

Table 11 Multiple Regression Coefficient of C Accreditation School

<i>Model</i>	<i>Unstandardised Coefficients</i>	
	B	Std. Error
Constant	3.222	.127
School Well-Being	.003	.001
Student Well-Being	.005	.002

Based on Table 11, the multiple linear regression equation for C accreditation school was as follows:

$$Y = 3.222 + 0.003X_1 + 0.005X_2 + e$$

The multiple regression coefficients for school well-being and student well-being were 0.003 and 0.005, respectively. These positive coefficients suggest that both school well-being and student well-being positively influence student engagement levels. In simple terms, higher levels of school well-being and student well-being are associated with increased student engagement.

The results of hypothesis testing confirmed that school well-being and student well-being together have a positive and significant impact on student engagement in biology learning. These findings align with prior research by Diastu et al. (2023), which demonstrated a significant relationship between school well-being and student engagement. This may be due to a conducive school environment that meets students' emotional and cognitive needs, thereby fostering higher engagement (Ernawati et al., 2022). This indicates that students who perceive their school environment positively, with basic needs met, are more likely to engage actively in learning activities.

The close relationship between school well-being and student well-being suggests that school well-being affects student well-being. In addition to school well-being, other factors, such as curriculum structure and grading systems, can influence student well-being. Environmental modifications, such as outdoor learning activities, can support students' learning opportunities and enhance their well-being (Hossain et al., 2014; Hossain et al., 2023). Personal interviews with students from A-accredited schools supported this, as students expressed that biology lessons were engaging and the material was easy to understand, which positively impacted their engagement and learning outcomes. Improvements in student well-being are closely tied to positive outcomes in other areas of

education. This highlights the need for schools to foster an inclusive, supportive, and nurturing environment to maintain student well-being and increase engagement.

In the educational context, aspects of well-being such as relationships and support from peers, family, instructors, and school resources influence students' motivation to engage in the learning process, particularly in biology. For students in A-, B-, and C-accredited schools, behavioural and emotional engagement indicators were evident, especially when strong relationships with teachers and peers were established, and students felt confident in the learning process. This relationship positively impacted their involvement in biology lessons, as they exhibited enthusiasm, interest, and active participation in classroom activities. This is consistent with student feedback, indicating that biology lessons were engaging and the material was accessible, demonstrating that higher levels of school and student well-being correlate with higher levels of student engagement in the learning process, particularly in biology.

CONCLUSION

This study found that school well-being, student well-being, and student engagement among students in South Sumatra were generally categorised as moderate. However, differences in school accreditation resulted in variations in the dominant indicators of student well-being. Students in A-accredited schools displayed a stronger focus on cognitive factors. In contrast, those in B-accredited schools were more influenced by physical factors and those in C-accredited schools by psychological factors. The combined effect of school well-being and student well-being on student engagement in biology learning was positive and significant. The relationship between school well-being and student engagement was evident through students' interests, values, and positive feelings, which were influenced by a safe, comfortable, and supportive school environment. Positive social relationships, such as teacher attentiveness, interpersonal connections, and adequate facilities within the school and classroom, contributed to this relationship. Furthermore, the connection between student well-being and engagement was shaped by factors like curriculum structure, assessment methods, and adaptable aspects of the learning environment. This study recommends that, despite differences in the dominant indicators of student engagement in biology across schools with A, B, and C accreditation, school policymakers should prioritise both school and student well-being to foster higher levels of student engagement in the classroom.

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