

A Multilevel Analysis of Leadership of Middle School Subject Leaders, Blended Learning and Information Management Practices on Student's Learning Engagement

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ABSTRACT

In the turbulent world of education, knowledge of how the complex web of elements can affect student learning engagement (SLE) is vital. This study is an intensive examination of how different variables are related to each other in the peculiar setting provided by Chinese middle schools. Those key variables include blended learning (BL), middle school subject leader leadership (MLSSL), information management practices (IMP), socioeconomic status (SES) and student learning engagement (SLE). Collecting data by means of a multi-level analysis, teachers (N=47) and students (N=328) at four Chinese middle schools in Jiangxi were surveyed. This study shows that BL, MLSSL and IMP had significant direct effects on SLE both at the teacher level and at the student level. Without a doubt, they play important roles in stimulating student interest. In addition, SLE takes on the role of a mediating factor, revealing its significance in connecting these variables. The study also shows little direct impact of SES on SLE, implying that background by itself can play only a limited role in inducing student involvement. By connecting the dots between these variables and looking at their relationships, this study has practical as well as theoretical significance for education. However, it provides guidance for educators and policymakers on how to attract students, make better use of technology, and build teacher leadership and information management. The study also enriches educational theories: it incorporates these crucial factors into the discussion of student engagement, thereby deepening our understanding of the complexity and richness found in Chinese middle schools.

Keywords: Student Learning Engagement (SLE), Blended Learning (BL), Middle School Subject Leader Leadership (MLSSL), Information Management Practices (IMP), Socioeconomic Status (SES).

INTRODUCTION

As education continuously changes, understanding what makes student learning engagement exist has become more and more important. The goal is to explore the complex relations between important variables such as blended learning (BL), middle school subject leader leadership (MLSSL), information management practices (IMP), socioeconomic status (SES) and student learning engagement (SLE), taking place within the Chinese middle schools. Working at two levels, teachers and students, this study aims to offer many insights that will be of value both in guiding educational practices and in contributing to efforts toward higher-quality education.

The variables examined in this study have been

thoroughly broken into various nuanced components through previous research. Blended learning, which combines the advantages of technology with those of traditional instructional methods, has emerged as a powerful academic model for creating an interactive and personalized learning environment (Christodoulou & Angeli, 2022). Likewise, subject leader leadership at the middle school level has been attracting much attention recently, identified as an influential power to propel teacher development and promote general school advances. It can affect both teaching practices and student outcomes in a fundamental way (Luo, Wang, & Yu, 2022).

Here, amidst these well-researched elements, the focus is

now being cast upon the long-denied realm of information management practices. This little-explored variable in educational research is packed with meaning. If integrated into classroom processes, it could reduce classwork and raise standards of instruction (Bowie, 2021). What is more, socioeconomic status continues to prove a heavyweight factor influencing student academic performance and engagement. Those from higher socioeconomic backgrounds naturally benefit both sides of the coin by having easier access to resources and opportunities than their peers (Olsen & Huang, 2021).

Although many small-scale studies have highlighted the separate influence of each variable, it now becomes increasingly pressing to understand how these variables interact with one another, and their combined effect on student engagement (Salta, Paschalidou, Tsetseri, & Koulougliotis, 2022). Previous works are invaluable, but they shed direct light only on the separate effects of these variables. Thus a large hole remains in our understanding of their interdependencies (Boardman, Vargas, Cotler, & Burshteyn, 2021; Rajabalee & Santally, 2021). Furthermore, this exploration is pushed forward by geographical conditions--the unique educational environment of Chinese middle schools. Exploring this unusual environment is key to revealing the cultural and institutional complexities underlying these relationships. This is a frontier at which explaining such multifaceted relations approaches its limit (Lee, 2023; Teng, He, & Qiao, 2023).

These findings from past research indicate the significance of the variables at issue. In this way, blended learning and middle school subject leader leadership have already become two important ingredients of good teaching practices and student results (Bedregal-Alpaca, Tupacyupanqui-Jaén, Delgado-Barra, Guevara, & Laura-Ochoa, 2022). Classroom procedures can be improved through information management techniques, and are least developed. But what is its role in making students more participative (Rocha et al., 2023)? Furthermore, the role of socioeconomic status in engagement should be examined within the particular educational setting of Chinese middle schools (Ren, Hu, & Zhang, 2021).

So based on this literature landscape, we can see that there is a pressing need for an integrated investigation of these variables in Chinese middle schools (An et al., 2023). This unique learning environment, coupled with the difficulties of multi-level analysis, offers another opportunity to focus in on the synergistic effects that can impact student engagement (Grandón, Díaz-Pinzón, Magal, & Rojas-Contreras, 2021). Toward this end, this research collects data on the relationships (associations or links) between blended learning and middle school subject leader leadership, information management practices, socioeconomic status and student learning engagement; these also fill in shortcomings in existing theoretical frameworks for educational improvement as well as practical strategies.

LITERATURE REVIEW

For a more thorough explanation, it is necessary to examine in closer detail the techniques and procedures which middle school subject leaders can follow (Antonopoulou, Halkiopoulos, Barlou, & Beligiannis, 2021). One key strategy is adopting a transformational leadership style (Afriyie, Du, & Ibn Musah, 2019). It is the kind of leadership that encourages and pushes instructors in their attempts to raise levels of commitment while encouraging and spurring students at the same time (Li & Liu, 2022). This can be done by developing a captivating school vision, promoting a good cooperative culture and bringing creative approaches to teaching (Shava & Heystek, 2021). Another key aspect is the emergence of teacher leadership in the institution itself (Li & Liu, 2022). Teacher-leaders who really care about student involvement are a job for subject leaders. Through disseminating best practices, coaching friends and implementing student-centered plans these become agents of change (Afriyie et al., 2019). In this manner, with a structure for decentralized authority, the school will have an environment of constant progress and unity. This will be of great value for student involvement (Antonopoulou et al., 2021).

Other subject leaders can glean trends and patterns in student interest through data-driven decision-making, and change the way they operate (Shava & Heystek, 2021). Teachers and students are also encouraged to give feedback often. It can help leaders make better decisions and tailor solutions to real needs (Lipscombe, Tindall-Ford, & Lamanna, 2023). In fact, this approach is similar to the idea of instructional leadership (Li & Liu, 2022). Under instructional leadership, subject-based leaders are very active in how teaching and learning take place at their institutions. And third, transformational leadership with opportunities for teacher leadership and data-informed decision-making can produce gargantuan increases in student participation (Pinto, Abreu, Costa, & Paiva, 2022). By employing these tactics, the subject leaders can fashion an environment of learning that is both interesting and conducive to better educational results (M. Carvalho, Martins, Santos, & A. B. Carvalho, 2022; Pinto, Abreu, Costa, & Paiva, 2023). This study is to explore these tactics further, as well as their applicable value in the Chinese middle schools environment (Pichainarongk & Bidaisee 2022).

The role of leadership within the educational environment, and especially that reported by middle school subject leaders (Lipscombe et al., 2023), has received increasing attention. There are the efforts of subject leaders, who prepare, organize and make arrangements for creating an atmosphere conducive to studying (Bedregal-Alpaca et al., 2022). Grandón et al. (2021) point out that good school leadership is key to students' learning. Studies have shown that leadership principles can influence teacher morale, the quality of instruction, and student involvement (M. Carvalho et al., 2022; Pinto et al., 2023). To give an example, behaviors of instructional leadership that involve clarifying expectations for students, providing guidance, and creating a favorable environment for learning all have been found to be positively related to student motivation and engagement

(Anselmus Dami et al., 2022).

There are already a few research papers published on this topic, but the relationship between middle school subject leaders' leadership styles and student learning engagement has not been researched very much at all in the context of China (Chen, Ning, & Bos, 2022). In the changing educational landscape with the demanding expectations of school leaders, it is clear that much depends on how their leadership practices are linked to student engagement (Buffone, 2021). According to Social Cognitive Theory, people learn through observation and imitation (Cai & Shi, 2022). Applied to educational leadership, this theory says that effective leaders show students what they should be like and thereby molds their attitudes and behavior (Gladstone & Cimpian, 2021). Through clear guidance, promoting a good learning environment and conveying their excitement for learning and studying, middle school subject leaders can shape students' self-efficacy beliefs and desire to actively participate in their own journey of learning (Pinto et al., 2022).

H1: Leadership of middle school subject leaders significantly impacts student's learning engagement.

Middle school subject leader leadership is the process by which subject teachers, alone or in groups, optimize teaching and learning quality. The goal is to higher student engagement in learning. Middle school subject leaders are the area of responsibility for subject leaders that affect education inside and outside the classroom. Middle school subject leaders' leadership in the learning environment must be adjusted according to the teaching subjects. Each subject has different characteristics. Through blended learning, subject leaders should be able to motivate students and get them through a task, or learn both actively and personally in class; they must provide relief to the learning process.

Pedagogically, blended learning, which espouses integrating classroom instruction with online components, has become extremely popular (Miranda et al., 2021). As Zimba, Khosa, and Pillay (2021) state in their research, blended learning can result in higher student involvement and better educational results. In a blended learning environment, students are able to see peers interacting with the online resources and instructors. This accords with Social Cognitive Theory's emphasis on observational learning (Cai & Shi, 2022). Furthermore, because blended learning is flexible and adaptable, it can cultivate students' self-regulation skills, which encourages them to be active in the course of their studies (Salta et al., 2022). As blended learning has now been around for a while, there is already research into its effectiveness in promoting student engagement. What would be interesting to explore is the effect of blended learning on student engagement within the Chinese middle school environment (Lee, 2023). Given the increasing need to combine technology with traditional teaching methods in education (Bedregal-Alpaca et al., 2022), it is important to understand how blended learning practices affect engagement.

According to Social Cognitive Theory, observational learning and self-regulation are the two important mechanisms in acquiring new behaviors (Cai & Shi, 2022). In

the environment of blended learning, students can observe and emulate behaviors related to effective online training (Boardman et al., 2021). Secondly, mixed learning environments combine flexibility and autonomy with the principles of self-regulation that can increase the motivation and intensity of students (Rajabalee & Santally, 2021).

H2: Blended learning significantly impacts student's learning engagement.

Information management practices are about the order, accessibility, and use of learning resources to improve people's experiences in education (Buffone 2021). Bowie (2022) has done studies to show the importance of information management in education. These activities allow students to take hold of their own learning by stimulating self-regulation and real participation (Rajabalee & Santally, 2021). To study their impact requires that we get to the nitty-gritty of interventions on information management practices (IMP), middle school subject leader leadership (MLSSL) and blended learning (BL). In educational settings, according to several studies (Rocha, Muñoz-Repiso, & Costa, 2023), it is necessary to specify exactly what kind of IMP interventions are needed. For example, resource management systems that are digitally integrated and planners of instruction based on data all provide a more concrete strategy. You can get a better idea of how information is applied in educational places. Getting a further understanding of how these practices have been deeply integrated into everyday classrooms will help us better understand their value (Cai & Shi, 2022).

This is in line with the focus on self-regulation of Social Cognitive Theory, and students who control learning resources are naturally more likely to be both interested and involved (Park & Kim, 2022). Information management practices are important in the overall functioning of a school, but little attention has been given to their effect on student learning engagement in the Chinese middle school environment (Lipscombe et al., 2023). Studying this relation is important because students' information management abilities could have a major impact on how they interact with the learning process (Bowie 2023). Cai and Shi (2022) note that Social Cognitive Theory holds that the individual can control his or her own behavior and learning processes. Through effective information management practices, students are able to use self-regulation to learn how to organize, retrieve and apply knowledge in using information for learning (Park & Kim, 2022). This abides by the precepts of self-regulation and motivation espoused in Social Cognitive Theory (Anselmus Dami et al., 2022).

H3: Information management practices significantly impacts student's learning engagement.

Mediation is the process whereby the influence of one variable on another is transferred through a third variable.

Direct relationships have been the focus of research on educational leadership and student engagement (Chen et al., 2022). In addition, it is important to point out differentiated MLSSL behaviors and operating methods. Deriving their insights from detailed explanations of leadership approaches, such as encouraging a collegial spirit among teachers or using transformational leadership techniques (Christodoulou

& Angeli, 2002), they add depth. The influence of subject leaders in the educational ecosystem is also defined by actual examples of successful initiatives led by those subject leaders (Park & Kim, 2022). However, the mediating role played in this relationship by information management practices has received little attention (M. Carvalho et al., 2022). As far as we know, little research has been done on the possible mediating effect of information management practices between leadership and student engagement in Chinese middle schools (Rocha et al., 2023). Examining this mediation can uncover more understanding of how successful leadership behavior brings about information management policy which ultimately comes to bear on student engagement (2022). As an example, one of the takeaways from Social Cognitive Theory is that leaders affect behavior and learning via modeling and expectation (Christodoulou & Angeli, 2022). They can also create a culture of information management transparency that puts the students in control of their learning journey (Bowie, 2022). Through these practices, students are exposed to such behaviors, which can improve their work performance. Their engagement aligns with Social Cognitive Theory (An et al., 2023).

H4: Information management practices significantly mediate the relationship of leadership of middle school subject leaders and students' learning engagement.

Socioeconomic status (SES) includes the social and economic background of persons or families, which can influence a range of educational experiences. (Olsen & Huang, 2021) SES has been identified as a major contributor

to educational outcomes through extensive research (Buffone, 2021). SES can affect people's access to resources, support systems and opportunities for learning. This may result in unequal engagement or achievements (Chen et al., 2022). Although research has recognized the impact leadership can have on student participation and attainment, little attention has been paid to how SES relates to leadership practices as they are observed in the real-life circumstances of Chinese middle schools (Anselmus Dami et al., 2022; Salta et al., 2022). With the possibility of SES-related inequalities involved, looking into the role played by SES as a modulator of this relationship would contribute to ensuring more egalitarian educational environments (Grandón et al., 2021). External factors, such as environmental conditions and social class, play an important role in the behavior of individuals and their learning outcomes (Anwar, Channa, & Shah, 2023; Cai & Shi, 2022), according to Social Cognitive Theory. Because students come from various socioeconomic backgrounds, they may respond differently to leadership strategies. Some groups have greater access to resources and support than others (Olsen & Huang, 2021; Shaikh, Afshan, Anwar, Abbas, & Chana, 2023). We can narrow the gap in engagement if we use effective leadership practices that meet student needs right where they are (Gladstone & Cimpian, 2021).

H5: Socioeconomic status of students significantly moderates the relationship of leadership of middle school subject leaders and students' learning engagement.

Figure 1 shows the conceptual model.

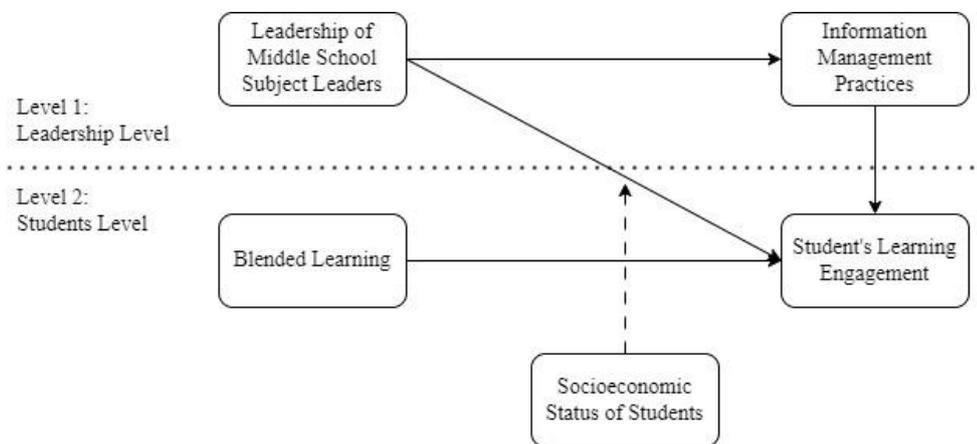


Figure 1. Conceptual Model

METHODOLOGY

Participants were selected from four Chinese middle schools in Jiangxi, China. Data were collected at two levels: Forty-seven teachers working in these middle schools completed the level 1 data, which included an assessment of the leadership skills of middle school subject leaders and practices concerning information management. The variables related to student learning engagement, socioeconomic status and blended learning were included in the level 2 data that was collected from a total of 328 students enrolled in courses at the same middle schools. Using this multi-level approach made it possible to study in its entirety the factors

that influence student learning engagement within Chinese middle schools. Surveys were conducted to collect data among the attending teachers and students. The surveys were meant to evaluate different constructs including middle school subject leader leadership, information management practices, student learning engagement, socio-economic status and blended learning. Teachers were reported on leadership and information management practices. At the same time, students reported on their own learning engagement, level of education (socioeconomic status) and reception to blending learning.

Participants were chosen from four Chinese middle

schools in Jiangxi, China and represent a well-rounded cross section of students and teachers. Level 1 data were collected from 47 teachers actively working at those middle schools. These educators represent 65 % women and 35 % men; they include experienced faculty as well as those just beginning their teaching careers. The 328 students were enrolled across all grades and various academic subjects in these same middle schools. Their distribution across grades was about one-third from each of Grades 6, 7 and 8 and about a fourth from Grade 9. The gender distribution was also relatively equal with 51 % male students and 49 % female students. Furthermore, the students' ages also varied, with most lying between 12 and 15 years of age, within the range that is considered typical for middle school students in the area. This sample- which is neither homogeneous nor unbalanced- enables an examination of all the factors influencing student learning engagement within the Chinese middle schools in Jiangxi, China.

The socioeconomic status of the participants was determined by using the three-item demographic questions of Dicaldo and Roch (2020). The eleven-item scale for blended learning comes from the study by Jachin and Usagawa (2017). From Bjørnson and Dingsøyr (2009), a four-item information management practices scale was constructed. Moreover, middle school subject leaders' leadership was measured using a six-item scale (Minadzi & Nyame, 2016). A five-question scale (Bouilheres, Le, McDonald, Nkhoma, & Jandug, 2020) was used to measure the students' learning engagement. See the questionnaire in **Appendix 1**.

The data were analyzed using WarpPLS 8.0 software. One important consideration in this study's research design was the need to analyze multi-level data. That is why this software package was adopted. With WarpPLS, it was possible to determine the relationships between variables collected at both levels. It allowed a more comprehensive investigation into which factors affect student learning engagement. Merging the data gathered at both levels was done using a unique identifier such as a participant ID. In this way, teachers' and students' responses could be accurately linked. This combined dataset allowed a comprehensive investigation into the interrelationships between leadership, Information management practices, blended learning, socioeconomic status and student learning engagement. Teacher participants were required to be currently employed at one of the participating middle schools and have experience working with middle school subject leaders. Participating students had to be enrolled in courses at the Chinese middle schools. In order to guarantee that the sample correctly represented the target population. We had no special exclusions based on your age or other factors.

The data collection, merging, and analysis steps used in this study were designed to systematically explore all the factors influencing student learning engagement within Chinese middle schools utilizing a multilevel approach combined with specialized software.

RESULTS

The results shown in **Table 1** reveal that the model used in this study is reliable and valid, with solid foundations upon which to build future analyses and interpretations. Cronbach's alpha coefficients are used to measure the internal consistency of the scales: All constructs--blended learning (BL), middle school subject leader leadership (MLSSL), information management practices (IMP), student learning engagement (SLE) and socioeconomic status (SES) all have acceptable to high levels of reliability. And the Cronbach's alpha coefficient for blended learning (BL) reaches a particularly high value of 0.928, indicating extremely strong internal consistency in the measurement of this construct.

Also supporting the model are the composite reliability coefficients, which indicate the total reliability of these constructs. All coefficients are over 0.85 for every construct, so high reliability everywhere. This confirms that the variables measured are being done so under a consistent and stable measurement model. Average variances extracted, which represent the percentage of variance explained for each construct, also have relatively strong values. In addition, both constructs have extracted a large portion of the variance in their respective variables; average variances extracted exceed 0.66 for IMP and BL respectively. Further, the relation between socioeconomic status (SES) and Middle School Subject Leader Leadership (SES*MLS) has a complete coefficient of 1.0, so this interaction term is clearly significant.

In brief, the numbers in **Table 1** tell us that the measurement model is reliable and accurate. One can feel secure about proceeding to the following analyses which will look at interrelations between these constructs. High internal consistency, reliability and the amount of variance explained by each construct guarantee the robustness of the model and its suitability for investigating the multifaceted relationship between leadership, blended learning, information management practices, socioeconomic status created by schools and student learning engagement in middle schools in China.

Table 1. Reliability and Validity Statistics of Model

Cronbach's Alpha Coefficients					
BL	MLSSL	IMP	SLE	SES	SES*MLS
0.928	0.827	0.827	0.774	0.544	1
Composite Reliability Coefficients					
0.94	0.875	0.885	0.849	0.767	1
Average Variances Extracted					
0.593	0.544	0.66	0.539	0.526	1

The loadings of variable indicators are presented in **Table 2**, which reveals the connections between observed variables and their latent constructs in the model. These loadings indicate the strength and direction of relations, providing a measure of how well observable variables reflect underlying constructs. The results show that a number of the variables

are highly loaded on their respective constructs. For example, in the case of the blended learning construct indicators (BL1 to BL11), their loadings are rather large, from about 0.537 to 0.874. These values indicate that these indicators are measuring the latent construct of blended learning.

Also, the middle school subject leader leadership construct indicators (MTL1 to MTL6) are significantly loaded. Therefore they are highly related to the underlying construct of middle school subject leader leadership. In addition to this, the information management practices create indicators (IMP 1, to IMP 4) all with significant loadings that indicate their strong association with the latent construct of Information

Management Practices. The strength of the indicators in capturing student learning engagement and socioeconomic status constructs is also reflected in loadings for both. Moreover, the p-values linked to all the loadings are less than 0.001, reflecting statistical significance and validating relationships between observed variables and their encompassing latent constructs. In short, the results shown in **Table 2** demonstrate that these observed variables were able to capture their respective constructs within the model. That is, it affords us confidence that the measurement validity of this study's constructs is satisfactory and adds robustness to our analysis as a whole.

Table 2. Loadings of Variables Indicators

	BL	MLSSL	IMP	SLE	SES	SE	P Value
BL1	0.794	0.019	1.575	0.386	0.835	0.049	<0.001
BL2	0.885	-0.261	-1.159	-0.329	-0.583	0.048	<0.001
BL3	0.729	-0.123	2.133	0.513	0.596	0.05	<0.001
BL4	0.725	0.059	-0.658	-0.558	-1.005	0.05	<0.001
BL5	0.858	-0.218	-0.883	-0.47	-0.482	0.049	<0.001
BL6	0.748	-0.175	1.95	0.468	1.007	0.049	<0.001
BL7	0.867	-0.426	-0.944	-0.326	-0.547	0.049	<0.001
BL8	0.537	1.226	-1.512	0.581	0.627	0.051	<0.001
BL9	0.556	1.36	-1.4	-0.116	-0.305	0.051	<0.001
BL10	0.802	-0.141	1.604	0.533	0.799	0.049	<0.001
BL11	0.874	-0.402	-1.007	-0.37	-0.603	0.049	<0.001
MTL1	0.727	0.536	-0.612	0.346	-0.703	0.051	<0.001
MTL2	-1.884	0.784	1.842	0.396	0.816	0.049	<0.001
MTL3	2.066	0.78	-0.675	-0.626	-0.74	0.049	<0.001
MTL4	0.244	0.722	-1.396	0.211	0.325	0.05	<0.001
MTL5	0.796	0.731	-1.19	-0.404	-0.457	0.05	<0.001
MTL6	-1.536	0.834	1.544	0.163	0.495	0.049	<0.001
IMP1	1.942	0.063	0.821	-0.45	-0.574	0.049	<0.001
IMP2	-2.216	0.01	0.844	0.414	0.842	0.049	<0.001
IMP3	-1.833	-0.123	0.841	0.513	0.596	0.049	<0.001
IMP4	2.464	0.059	0.737	-0.558	-1.005	0.05	<0.001
SLE1	-1.946	-0.348	2.001	0.571	0.981	0.051	<0.001
SLE2	-0.552	-0.004	-0.094	0.879	0.254	0.049	<0.001
SLE3	2.822	-0.261	-1.159	0.542	-0.583	0.051	<0.001
SLE4	-0.501	0.062	-0.114	0.894	0.13	0.048	<0.001
SLE5	0.73	0.409	-0.467	0.708	-0.825	0.05	<0.001
SES1	-1.937	-0.33	2.067	0.069	0.738	0.05	<0.001
SES2	1.898	-0.59	-0.667	-0.485	0.796	0.049	<0.001
SES3	-0.13	1.127	-1.574	0.53	0.632	0.05	<0.001

Table 3 shows the correlations between variables, which allows us to understand relations and associations among study constructs. Blended learning and middle school subject leader leadership, information management practices, student learning engagement, and socioeconomic status all

have strong positive correlations of between 0.664 and 0.814. This shows that Blended Learning and these variables go hand in hand: higher levels of implementation are positively related to stronger middle school subject leader leadership, more effective information management practices, better

student learning engagement and greater socioeconomic status. In addition, the relationships between MLSSL and IMP, SLE and SES are also positive and significant. This indicates a network of positive associations among these constructs. This appears to indicate that good examples of middle school subject leader leadership are linked with better information management practices, greater student involvement, and higher socioeconomic status.

Oddly, SES*MLS-the product of the two variables Socioeconomic Status and Middle School Subject Leader Leadership--has inverse correlations with all other variables. It follows that the connection between SES and MLSSL is perhaps different and contrasting from other constructs. This is a point of considerable interest for the research, because it may indicate how socioeconomic status moderates the effects of subject leader leadership on student learning engagement at middle school. To sum up, **Table 3** offers insightful information about the relationship among the variables of this study. And it shows that there are positive links between blended learning, middle school subject leader leadership, information management practices, student learning engagement and socioeconomic status. Moreover, the negative relationship between SES*MLS and other variables highlights that the possible moderating effect of socioeconomic status on middle school subject leader leadership needs to be explored in greater depth.

Table 3. Correlation among variables

	BL	MLSS L	IMP	SLE	SES	SES* MLS
BL	0.77	0.81	0.814	0.672	0.76	-0.423
MLSS L	0.81	0.737	0.827	0.664	0.603	-0.511
IMP	0.814	0.827	0.812	0.659	0.659	-0.405
SLE	0.672	0.664	0.659	0.734	0.275	-0.543
SES	0.76	0.603	0.659	0.275	0.725	-0.298
SES* MLS	-0.423	-0.511	-0.405	-0.543	-0.298	1

Table 4 gives R-squared and Q-squared coefficients for the fit of the model as well as its predictive power with regard to the study's constructs. R-squared coefficients indicate the extent to which the model explains variance in each construct. In this table, for information management practices and student learning engagement, the R-squared coefficients are 0.687 and 0.705 respectively. These coefficients imply that the model accounts for 68.7 % of the variation in IMP and 70.5 % of the variation in SLE. Thus, the proportion of variation in these constructs explained by factors and relationships included in this model is considerable.

Table 4. Model Fitness and Effect

R-squared Coefficients						
BL	MLSSL	IMP	SLE	SES	SES*MLS	
		0.687	0.705			
Q-squared Coefficients						
		0.688	0.682			

The Q-squared coefficients offer an estimate of the model's explanatory power. This table: For IMP and SLE, the Q-squared coefficients are 0.688 and 0.682, respectively. These values show that the model can predict both information management practices and student learning engagement, because Q-squared is close to R-squared for these two constructs. Hence, the model has predictive capability for these variables. In general, the statistics in **Table 4** indicate that the model fits well and explains much of the variance in information practices and student activity (see **Figure 2**). Moreover, the model possesses considerable predictive quality with respect to these constructs: it is able to accurately forecast the levels of those variables and relationships used in its structure. These results add to the confidence in the model's analysis and recognition of what is driving IMP and SLE within the context of this study.

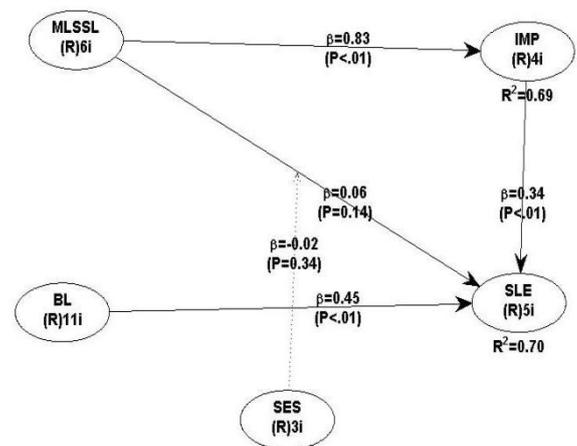


Figure 2. Estimated and Structural Model

In this study, we look at the influence of these factors on student learning engagement in Chinese middle schools and consider both teachers and students. The first level is for teachers, and we found that using Blended Learning has a very good effect on their information management practices (IMP) and information handling ability in the classroom. Furthermore, middle school subject leader leadership (MLSSL) is also highly influential and has a very positive impact on IMP among teachers. For students (level 2), we found that Blended Learning, Middle School Subject Leader Leadership and Information Management Practices all have very positive effects on their student learning engagement (SLE). This suggests that when teachers are using a blended method of instruction, showing strong leadership and managing information well then the students become more immersed in learning themselves.

While SES and its interaction with Middle School Subject Leader Leadership (SES*MLS) had little substantive effect on student learning engagement, they are all statistically insignificant. In other words, students' family background and its relation to school leadership do not appear at the moment to influence their degree of involvement in learning. In short, this study stresses the significance of blended learning, effective leadership, and information management

for increasing student involvement in Chinese middle schools. It also suggests that socioeconomic status has very little direct impact on student engagement itself (see **Table 5** for details).

Table 5. Direct and Moderating Path Analysis

Total Effects						
	BL	MLSSL	IMP	SL E	SE S	SES*MLS
IMP		0.829				
SLE	0.449	0.342	0.341			-0.022
Standard Errors for Total Effects						
IMP		0.049				
SLE	0.052	0.053	0.053			0.055
Effect Sizes for Total Effects						
IMP		0.687				
SLE	0.37	0.249	0.279			0.013
P Values for Total Effects						
IMP		<0.001				
SLE	<0.001	<0.001	<0.001			0.342

In this part of the study, we explored how student learning engagement (SLE) serves as a mediator between two key factors: blended learning (BL) and middle school subject leader leadership (MLSSL). We discovered that both Blended Learning and Middle School Subject Leader Leadership have large positive indirect effects on Student Learning Engagement. Therefore, these factors not only affect student engagement directly but also indirectly by way of some other intermediate factor or pathway. These indirect effects, for both BL and MLSSL, have p-values that are quite small--less than 0.001--demonstrating strong statistical significance. Moreover, the magnitudes of these indirect effects are about 0.206, attesting to their importance. This simply means when teachers use blended learning in combination with leadership, this helps drive the students to their lessons. This is significant because it means that these factors not only have direct but also indirect consequences on the extent to which students become involved in their schoolwork, a key requirement for effective learning in Chinese middle schools (**Table 6**).

Table 6. Mediating Path Analysis

Indirect Effects for Paths with 2 Segments					
	BL	MLSSL	IMP	SLE	SES
SLE		0.283			
P Values of Indirect Effects for Paths with 2 Segments					
SLE		<0.001			
Standard Errors of Indirect Effects for Paths with 2 Segments					
SLE		0.038			
Effect Sizes of Indirect Effects for Paths with 2 Segments					
SLE		0.206			

DISCUSSION

The results of this study shed new light on what factors influence student learning engagement in the environment of Chinese middle schools. The study used a multi-level analysis approach to examine the relationship among those key variables, including blended learning, middle school subject leader leadership, information management practices, socioeconomic status, and student learning engagement.

Secondly, the study discovered a number of major direct effects and relationships. Teachers. At Level 1, both blended learning and middle school subject leader leadership had significant positive effects on information management practices. It follows that when teachers integrate blended learning techniques and exemplify good leadership they have more control over the information within their classrooms. The results coincide with past studies that stressed the centrality of leadership of subject teachers and forward-looking instructional styles in schools.

At level 2, involving students, blended learning; middle school subject leader leadership, and information management practices, all had a positive direct effect on student learning engagement. These factors thus play a key role in promoting student interest. Particularly when teachers implement blended learning methods, display strong leadership capabilities, and control information well, students are more likely to be engaged in their education. This is consistent with previous research emphasizing the value of teacher practices and instructional approaches that promote student engagement. Our findings in examining the impact of blended learning and teacher leadership on student engagement highlight the intertwined relationship between these variables. Dynamic blended learning combining technology and traditional methods suits the effective leadership of teachers. This creates a favorable climate for student motivation and participation. However, implementation difficulties and resource differences might prevent the full reaping of these benefits. Moreover, differences in cultural nuances and school policies also determine the extent to which these approaches are effective. Students are engaged differently in different educational settings. Some of the findings appear to be rather subtle, but cumulatively they provide a richer perspective on how blended learning and teacher leadership combine to influence student engagement. The need for all-encompassing educational strategies is becoming more apparent.

In addition, the study examined student learning engagement as a mediating factor between certain variables. Indirect effects on SLE through intermediate pathways were found for both blended learning and leadership of middle school subject leaders which proved to be statistically significant. Thus these factors both directly affect students 'engagement and perhaps indirectly, by way of things such as motivation or interest in the learning process. These results expand our knowledge of the complexity among these variables and the role of student involvement as an intermediary.

These findings compare favorably with previous research

in several ways. Teaching techniques, like blended learning, have been shown to engage students in multiple educational settings (Park & Kim, 2022; Zimba et al., 2021). Likewise, the school leadership's function of promoting healthy teacher conduct that leads to better student outcomes is well known (Anselmus Dami et al., 2022).

But what makes this study particularly special is its analysis of these factors in the distinct environment of Chinese middle schools. Though previous research has studied the impact of blended learning and leader temperature in education, this study uncovers their meaning for Chinese education, in which cultural and institutional differences might influence how they play out. In addition, the presence of Information Management Practices as a variable of interest is rather novel and shows its importance in educational settings.

Basically, the results of this study highlight how Blended Learning, Middle School Subject Leader Leadership and Information Management Practices play important roles in promoting Student Learning Engagement in Chinese middle schools. These findings are consistent with larger bodies of educational research while providing a distinctly local angle. For educators and policymakers, a more profound understanding of the complex relations between these variables can serve as the basis for developing strategies to foster student involvement in schoolwork and improve the quality of middle school education.

CONCLUSION

In summary, this study explored the interrelationships of many factors which affect student learning engagement in China's middle schools. There are three key levers: Blended Learning, Middle School Subject Leader Leadership and Information Management Practices. These can be viewed as a multi-level examination of what could promote student motivation. These factors have clear direct effects on student learning engagement (SLE). They also affect indirectly, through mediation. Influence is overall pervasive. The results of the study suggest that innovative teaching methods, teacher leadership, and complete information handling are closely connected with student involvement. These findings accord with the direction in which educational research is generally headed and are of special interest because of their potential for application within Chinese middle schools. With educational institutions all over the world adjusting to changing paradigms of teaching and learning, it becomes ever more important to understand the highly complex interrelationships between all these variables. These are analysis and critical reflection on pedagogical processes intended to enhance methods of teaching; they will leave educators, policy-makers, and other stakeholders with much food for thought. It is a small step forward for the quality of education and learning in Chinese middle schools, ultimately.

THEORETICAL AND PRACTICAL IMPLICATIONS

This research has several practical applications for Level 1 (Teachers). Teachers should engage regularly in professional development concerning blended learning strategy and leadership skills. Teachers can use these programs to find new methods of teaching and novel models of information control. All these efforts eventually are for students--to get them involved in learning and growing. Moreover, it is necessary to promote cooperation between teachers and the masters of individual middle school subjects. If educational institutions can exchange effective teaching practices and leadership insights, such an environment for teaching will be created which is full of life.

The study emphasizes practical implementation for Level 2 (Students). Afterwards, teachers still need to put the methods of blended learning into use, using technology and a variety of materials in instruction according to each student's different study styles and tastes. Moreover, schools should also endeavor to create a collaborative and stimulating learning environment which encourages active involvement, critical rethinking and experimenting, so as to foster greater student interest.

Level 1 (Teachers): theoretical implications of the research. In educational settings, teacher leadership becomes a central concept. Such inevitably generates the requirement for theory that will encompass teacher leadership as a basic and integral aspect in the processes of education and its outcomes. Also, the study clearly points to technology or blended learning as being an important facet of modern teaching theories. New educational theories must consider deeply the bearing of technology on instruction.

The theoretical implications are also apparent at Level 2 (Students). Such a study is in keeping with the theory of student-centered learning, in which students take an active role in their education. Student engagement should be a fundamental component of theoretical models, given its power to affect learning outcomes heavily. Additionally, the research shows that student engagement plays a mediating role in educational processes. A theoretical framework needs to explore the complex nature of engagement and get at how it affects learning outcomes.

In sum, this study provides concrete advice to teachers and institutions. It advocates professional development, teamwork, and student orientation. For theoretical implications, one can propose new educational theories that emphasize a teacher-led approach and technology integration while reconsidering student engagement in developing effective learning practices for both teachers at all levels (primary to university) and students.

LIMITATIONS AND FUTURE DIRECTIONS

This study certainly points the way forward but is not without its limitations. Secondly, the research data was collected from four Chinese middle school located in Jiangxi, China. The generalizability of their findings is thus limited to

situations like those encountered in other regions or countries with different educational contexts. Moreover, upon using self-report surveys, there is the possibility of response bias and social desirability bias. The results may be inaccurate as a result. In addition, the study investigated only a selected group of variables; other important factors determining student engagement may not have been considered. In particular, because of the cross-sectional nature of the data, it is not possible to establish causality among the variables. This should be kept in mind when interpreting my findings.

Adding to this study, future research can approach the topic from different directions. Secondly, broadening the research to include other types of educational institutes and regions would increase the general validity of conclusions. Also, using a combination of methods, including qualitative data techniques can provide further insight into the complicated relationships between variables. Further studies could also examine other variables or mediators that affect student involvement. Longitudinal studies may yield insights into the causal relationship between variables over time. Moreover, examining the effects of concrete steps intended to improve blended learning, teacher leadership and information management practices on student participation might provide useful ideas for teachers and policymakers.

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Appendix 1

Participant Information

1. Gender:

Male

Female

Other (Please Specify: _____)

2. Age: _____ (in years)

3. Parental Education Level:

Less than high school

High school graduate

Some college/Associate degree

Bachelor's degree

Graduate/Professional degree

Blended Learning Scale (11 items)

1. Blended learning enhances my understanding of the subjects.
2. The online resources provided in the blended learning environment are helpful.
3. We actively engage in online discussions and activities.
4. Blended learning fosters interaction with peers.
5. The use of technology in class improves our learning experience.
6. Assignments and assessments in the blended learning environment are clear.
7. The online materials complement the classroom teachings effectively.
8. We find blended learning motivating and engaging.
9. The instructor's use of technology aids in better comprehension.
10. Blended learning allows for personalized learning experiences.
11. The blend of online and offline activities helps in retaining information.

Information Management Practices Scale (4 items)

Please indicate the extent to which you agree with the following statements:

1. Teachers effectively organize and manage digital resources for the class.
2. The use of technology aids in efficient information delivery.
3. Classroom materials are systematically arranged and accessible.
4. Teachers utilize technology to streamline administrative tasks.

Leadership of Middle School Subject Leaders (6 items)

1. Encourages innovation and creative teaching methods.
2. Demonstrates effective communication skills.
3. Provides necessary support for professional development.
4. Fosters a collaborative environment among teachers.
5. Exhibits strong organizational and management skills.
6. Inspires and motivates teachers to excel in their roles.

Student Learning Engagement (5 items)

1. We actively participate in classroom discussions and activities.
2. We are motivated to learn and explore new concepts.
3. We seek additional resources to enhance my understanding.
4. We find joy and interest in the subjects we study.
5. We are committed to completing our assignments and tasks diligently.