



Kuram ve Uygulamada Eğitim Yönetimi  
Educational Administration: Theory and Practice  
2023, Cilt 29, Sayı 1, ss: 210-226  
2023, Volume 29, Issue 1, pp: 210-226  
www.kuey.net



## Permeable Educational Learning Environments: The Impact of the Space Environment Fosters Student Learning and Engagement

Zhenchuan Liu <sup>1\*</sup>, Donghui Cui <sup>2</sup>

	<b>Abstract</b>
<p><b>Article History</b></p> <p><b>Article Submission</b> 09 November 2022</p> <p><b>Revised Submission</b> 28 December 2022</p> <p><b>Article Accepted</b> 26 January 2023</p>	<p>The study focuses on the permeable learning environment, and student engagement as a mediating factor in learning motivation, and a permeable learning environment. The present study was built on the self-determination theory. For the analysis, (415) students from different colleges in China took part in a survey that was done both online and face-to-face survey. According to the findings of structural equation modeling (SEM), student participation improves the learning environment. The study's results also showed a connection between permeable learning environments, student engagement, learning motivation, and students in Chinese colleges. To maintain the accuracy of our model's understanding, additional research can be done. The use of a quantitative, closed-ended questionnaire had yet another disadvantage. The study's cross-sectional design makes it difficult to prove a cause-and-effect connection. Students' problems may involve their families, friends, and environment. It is essential to take into account when researching various facets of students' learning due to their major influence on their motivation to study and capacity to offer an open learning environment. There are important policy suggestions, inquiries for additional study, and suggested theoretical and practical consequences.</p> <p><b>Keywords:</b> Students Learning; Students Engagement; Permeable Learning Environment; Space Environment</p>

<sup>1\*</sup> Doctor, International College, Krirk University, Bangkok, Thailand, liuzhenchuan2022@163.com

<sup>2</sup> Professor, International College, Krirk University, Bangkok, Thailand, cuidonghui1976@126.com

## **Introduction**

While the term “permeability” was once used to describe, systems for learning and education are being made more permeable. (Keisling & Fox, 2021). The terms “permeable” and “permeability” are sometimes used for students to be able to switch between various educational levels such as colleges and higher education and various kinds of instruction (such as educational and vocational) as they see fit (Anungstri et al., 2022).

People working in colleges are aware of the vital role that relationships play in academic activity thanks to the expanding corpus of research on student performance, and they make every effort to promote learning engagements. Educational colleges are increasingly using the vocabulary of permeable design in their space planning as they seek every opportunity to enhance student learning interactions and situations (Vijapur et al., 2021). Planning and designing campuses with permeability results in more reactive and dynamic places that engage students and improve the students learning environment. Colleges have the potential to be learning spaces for all students, supervisors are realizing as campus facilities are assessed for student engagement and learning possibilities outside of classrooms (Lin et al., 2017).

Learning is a complicated human activity that has been the subject of in-depth study for many years. According to some, the strong learning drive of the pupils fosters a permeable learning environment by creating a conducive learning environment in education for students. Additionally, Guo et al (2022) assert that students who lead events and provide instructions for learning activities do so because they are motivated to learn. Therefore, the need to accomplish the goal gives rise to motivation. For the accomplishment of learning success, a desire to learn is crucial. Students must be capable of motivating themselves because doing so is essential for achieving such goals (Iqbal et al., 2022; Kohoulat et al., 2017). Experts frequently refer to the permeable learning environment or educational setting as all environmental factors and influences on learning programs (Fabiana Meijon Fadul, 2019; Kohoulat et al., 2017). A permeable learning environment is defined by Anungstri et al (2022) as the movement of information into and out of the classroom via linkages to the outside world. Through conversations, keynote speakers, and breakout sessions, experiential knowledge is brought into the class.

College libraries have long looked for creative ways to make use of their facilities, and more generally, they've been investigating the roles they play in indicators of student success like perseverance and engagement (García-Martínez et al., 2021). Libraries have a rare chance to modify and relocate the use of open environments in a manner that enhances expedition attempts for learning, engagement, and motivation as a result of these parallel investigations into creating permeable college areas to assist knowledge and student engagement and libraries' investigate of their role in the educational success (Li, 2022). The term “learning environment” refers to a variety of factors, including learning approaches, teaching assistant connections, educational interactions, and attitudes of students, in addition to physical area (Nur'Azizah et al., 2021). In reality, the concept of the learning environment can be defined in terms of the environment more than simply a classroom; it's a place where students are inspired by their circumstances and feel safe and encouraged in their search for knowledge (Li, 2022). An additional definition of the term “learning environment” is the instructors' or learners' moral judgments of their educational environment (Kohoulat et al., 2017).

The present study determines the permeable educational learning environments and the impact of space environment fosters student learning and engagement in colleges in China. The self-determination theory was established by the current investigation. Innovative initiatives designed to foster more independent school motivation have been developed as a result of the self-determination theory (SDT), which has increased students' tenacity and academic success (Ryan & Deci, 2000). These ideas serve as the foundation for the conceptual framework that is provided and empirically tested in this study.

In terms of theoretical, methodological, empirical, and practical implications, this study drew from the literature in the following ways: first, it adds to the theory in the literature by demonstrating how permeable educational learning environments and the impact of the space environment foster student learning and engagement in Chinese colleges. The remainder of the

study was structured as follows by the authors: Part 2 includes a literature review and conceptual framework with the creation of hypotheses. Part 3 provides the research methodology; Part 4 includes data analysis and interpretation; and Part 5 analyses the results, conclusions, and implications, in that order.

### Literature Review

This study determined certain areas based on students' permeable learning in a permeable learning environment as the student engagement and learning motivation as a mediator adoption in China, as well as established own self-determination theory involved.

#### Self-Determination Theory

The self-determination hypothesis states that if students have the materials they require, their student engagement will eventually improve following their learning processes and aims, and this application of the teaching methods will succeed in their learning environment. In conclusion, formal schooling, as well as students' permeable learning, could help students become more unique in their learning (Jeno et al., 2019). According to the self-determination idea, people engage in actions that they decide to conduct independently of other people. This is especially evident in settings that value uniqueness. Nowadays, creative and unique learning environments are adopted in the concept of self-determination (Jeno et al., 2019; Ryan & Deci, 2000). According to the hypothesis, education systems have looked into the attitudinal facets of proactive skillful conduct. Although the self-determination theory describes motivational variables, motivation in the college environment differs from motivation in other spheres of life. Due to its significant impact on students' willingness to study and ability to provide an open learning environment, it is crucial to consider when studying various aspects of the students learning. According to Ryan & Deci (2000), education, modeling, communicating objectives, and socialization between teachers and students, all boost motivation in the college learning environment. It is the motivating factor behind students' decisions and dictates how much work they will put into a classroom and how deeply they will contribute to the learning activities (Jeno et al., 2019; Ryan & Deci, 2000).

According to Ryan & Deci (2000), the internal driving factor underlying active inspiration is an individual's significant demands. To be successful in the workplace, one must feel productive and effective. The ability to take charge, manage one's behavior, and adhere to goals and principles of education. Autonomy, relatedness, and competence are three key tenets of self-determination theory. A sense of control and voluntary support for students' behavior is what is meant by autonomy (Jeno et al., 2019). Competence is the sensation of mastering a skill and succeeding in one's attempts of student education (Jeno et al., 2019; Ryan & Deci, 2000).

#### Student's permeable learning and learning motivation

The function of the instructor in guidance learning is crucially restricted. The function of the teacher is almost always to assign the highest level for the student's permeable learning and growth, regardless of whether it is in traditional academic discussions (Anungstri et al., 2022). The work and endeavors of the instructors seem to be the center of the entire educational system. In both the observational and analyzing stages, there are, nevertheless, variations and deviations for this straight link (Baber, 2020). A teacher who excels in one set of conditions might not be able to duplicate that success in another type of situation. So much so that, despite instructing in the same educational year, an instructor who does well in one area of a class might not be able to do so similarly well in the other part of the identical classroom (García-Martínez et al., 2021). These data suggest some unrelated variable(s) that mediate the typical relationship between the student's learning and learning motivation, without discounting the students' differences in abilities. Let's refer to this mediating factor as the student's engagement in their courses, which turns the professors' efforts into the growth of the students. The likelihood that students will learn in a lesson depends on their interest in the subject matter (Li, 2022; Rehman et al., 2020). Examining this is essential because academic success is greatly influenced by students' drive to learn (Fajri et al., 2021; Khandan & Shannon, 2021). Examining the role motivation plays in the conversation is essential since motivation is a vital factor in student performance and

conversation platforms are the most common medium for student permeable learning (Lin et al., 2017).

Additionally, studies have shown a strong link between students' learning motivation and permeable learning environments (Baber, 2020; Fabiana Meijon Fadul, 2019). Additionally, several researchers have used the self-determination theory (SDT) to examine students' participation intentions and learning settings (Jeno et al. 2019). Self-determination theory provides a thorough framework for comprehending factors that can strengthen or impair students' motivation for learning in classroom contexts (Ryan & Deci (2000)). Similarly to this, Korpershoek et al (2020) assert that to understand how self-motivated pupils might impact their learning efforts, it may be required to understand how learners' capacity to manage their ideas, enthusiasm, and learning activities. A person's internal drive to perform a task or action is known as motivation (Li, 2022). According to the self-determination theory, people's motivations differ based on the individual and the circumstance. To learn effectively, students need to be inspired, and if they are not, the teacher may find it difficult to get pupils to learn in their class (Abdulabbosovna, 2022). Students who were in itself driven in their college classes felt the material to be more valuable and were more involved in the learning experience according to Smiderle et al (2020). Students who had to participate in the course, on the other hand, felt less motivated and interested. According to (Smiderle et al., 2020), students' permeable learning positive impact on learning motivation. The prior researcher analyzed that student learning significantly influences students learning motivation (Anungstri et al., 2022; Baber, 2020; Fajri et al., 2021; Kohoulat et al., 2017).

H1: Students' permeable learning significantly impacts learning motivation.

Student's permeable learning and student engagement

Guo et al. (2022) expand the definition of permeability to have included visual permeable student learning (visual openings), workable permeable learning (the number of possible alternatives of an area), and organizational permeable learning (the number of organizational units having shared in an area). The term is still used to refer to locational opportunities and mobility. According to Smiderle et al (2020), permeable student learning refers to a complete environment of institutions, educators, professionals, students, and locations that are all open to one another. It is significant to stress that this work concentrates on permeable learning as describing physical, visual, workable, and organizational characteristics of learning spaces because permeable learning can signify numerous tasks, including within educational contexts. When used in the wider context, the term "permeable learning" in the context of college education refers not just to features of specific academic buildings but also components of branches plans, such as traffic patterns, architectural arrangement, and landscaping layouts (Baber, 2020; Fabiana Meijon Fadul, 2019). Building projects, vantage points, and other design components that encourage spatial permeable learning and enable flexibility of activity and motion are identified in master plans. Jeno et al. (2019) conducted a study that examined the connectedness and permeable learning significant impact on students' engagement.

Student engagement, which denotes a state of cognitive devotion to findings, correlates to participation in the educational sector (García-Martínez et al., 2021). Student engagement is characterized as a psychologically healthy state that consists of three fundamental commitments to learning (passion, devotion, and assimilation) (Fajri et al., 2021). Therefore, the desire to exert effort toward a certain action and to persevere in the face of challenges is interpreted as the strength factor. Secondly, engagement in the action and a sense of accomplishment and zeal for it are characteristics of the devotion aspect (Tabroni et al., 2022). The final component, absorption, deals with focus and participation in the task activity. Studies conducted in educational settings have demonstrated that personality and identity are related to student engagement, stimulate student participation, and have a beneficial effect on students in the form of high accomplishment and fulfillment (Anungstri et al., 2022; Smiderle et al., 2020). Additionally, there is a significant correlation between permeable student learning and student engagement (Nur'Azizah et al., 2021; Smiderle et al., 2020). Positive engagement results and general happiness are related in numerous research (García-Martínez et al., 2021; Guo et al., 2022; Khandan & Shannon, 2021; Siddiqi, 2019).

H2: Students' permeable learning significantly impacts student engagement.

### Student's permeable learning and permeable learning environment

By comparing the characteristics of conventional institutional-based government learning versus private learning that is unconstrained by institutes, locations, and duration, Korpershoek et al (2020) investigate yet another distinct kind of permeable learning in college education. Despite the study's emphasis on the debate between both government and private education, it showed how permeable education institutions, facilities, and connections are through students' behaviors. Although the emphasis of this article is still on the permeable learning of actual structures, the concept of permeable learning in college education has been expanded in a wider and more symbolic way (Kohoulat et al., 2017; Korpershoek et al., 2020). By incorporating furniture and elements that are incredibly malleable and adjustable, designers and builders support a functional permeable learning environment. The learning environment has a significant impact on how students conceptualize relativity and become more motivated to learn. Learning activities that guarantee the continuity of learning activities and give learning activities direction so that the desired outcomes of the formal discipline can be achieved are created by a permeable learning environment, inspiration and needs for learning, wishes and dreams for the future, and a desire to succeed. Among these duties are those of learning, engaging in educational interaction, inquiring, discussing, participating in group learning, applying what they have learned in other contexts, etc (Fabiana Meijon Fadul, 2019; Lizzio et al., 2002; Rehman et al., 2020; Smiderle et al., 2020).

Korpershoek et al. (2020) study primarily examined the permeable learning of college education, but it also highlighted the importance of permeable environments for greater interaction and learning in college education. The permeable of learning is what colleges aim to achieve when they alter environments, such as through increasing permeable students learning, rather than as means to an end in and of itself. Since focused student-permeable learning promotes student commitment and a permeable learning environment, college education has increased its emphasis on it across the college environment (Anungstri et al., 2022; Guo et al., 2022; Khandan & Shannon, 2021; Li, 2022). Parallel to changes in educational paradigms, student diversity, teaching aids, and college budgets, institutional understanding of the importance and value of involved student permeable learning has increased. Smiderle et al. (2020) stated that students' permeable students learning positively influences on college permeable learning environment. In previous studies, students' permeable learning significantly impacts on permeable learning environment (Anungstri et al., 2022; Guo et al., 2022; Khandan & Shannon, 2021; Li, 2022; Rehman et al., 2020).

H3: Students' permeable learning significantly impacts on permeable learning environment.

### Mediating Role of Learning motivation and Students engagement

Learning motivation has long been seen as a crucial element in education. Learning motivation is the drive that pushes them to carry out their academic duties and improve their learning techniques. If understanding is thought to be conscience, as suggested by self-determination theory, learning motivation has been considered to be an essential component for task completion (García-Martínez et al., 2021; Jeno et al., 2019; Li, 2022). When separating these two concepts, intrinsically motivated to learn a subject for fun and passion for learning, whereas external motivation relates to learning for specific purposes, such as to obtain a stronger situation or rank in the institution. In the studies, motivation has been identified as a component that affects college-level students' education (Fabiana Meijon Fadul, 2019; Korpershoek et al., 2020; Lizzio et al., 2002). Learners who had been more spontaneously or freely motivated excelled and showed more noteworthy learning outcomes, such as improved institutional adaptability, lower stress levels, and higher levels of tenacity. Things coming from both inside and outside of the student have an impact on their motivation to apply the theory of self-determination of the growth within the person. One of the key elements affecting how well students learn is motivation, which is viewed as an established factor (Khandan & Shannon, 2021). The number of students who will engage in a learning task or the amount of information they will retain depends on their motivation. Students who are driven to learn will employ greater cognitive abilities to understand the lessons, improving their ability to retain them. Examining motivation is crucial since it influences variables like permeable learning and student achievement (Rehman et al., 2020).

It has been noted that engagement is a key factor in determining a student's degree and quality of learning, particularly when it comes to increasing their academic performance, staying

in school rather than dropping out, and developing their interpersonal and thinking function (García-Martínez et al., 2021; Khandan & Shannon, 2021; Smiderle et al., 2020). When using a critical approach, students give the material a personal meaning by connecting new concepts to what they already know and have experienced in the outside world. When an underside strategy is used, pupils are more likely to concentrate on completing a task's objectives with the least amount of work possible, such as by memorizing information to replicate it later (Siddiqi, 2019). Adopting a certain learning strategy, whether it be a deeper or conventional approach, is the students' response to personal or contextual elements related to particular disciplines as well as to the perceived expectations for a particular learning activity (Khandan & Shannon, 2021). According to multiple studies, high student engagement scores and general happiness are associated. Multiple studies in educational settings have shown that identity and personality are linked to student involvement, encourage participation, and have a positive impact on students in the form of high success and fulfillment (García-Martínez et al., 2021; Khandan & Shannon, 2021; Korpershoek et al., 2020; Lizzio et al., 2002; Rehman et al., 2020; Smiderle et al., 2020).

H4: Learning motivation mediates the relationship between a student's permeable learning and permeable learning environment.

H5: Student engagement mediates the relationship between students' permeable learning and permeable learning environment.

#### Learning motivation and a permeable learning environment

Motivation has a crucial part in encouraging someone to take action, according to Smiderle et al. (2020). One of the elements that impact learning efficacy is learning motivation. If there is a motivating factor, such as learning motivation, a learner will learn effectively. If a student has a high level of learning motivation, they will study diligently. Motivation is a complicated component of human cognition and behavior that affects how people choose to spend their energy, according to Fajri et al. (2021). According to Rehman et al. (2020) "Learning motivation", which generally includes several criteria or enabling components, is the internal and external motivation provided to students as they learn how to behave. One of the reasons it is challenging to increase people's learning motivation is the low level of concern displayed by educators and parents (Baber, 2020). The facts that have so far come to pass demonstrate that when there are issues with students who have low motivation to learn, colleges and administrators don't seem to respect them. Instructors will let lazy students participate in class, and even parents don't seem to be concerned about their children's learning environments. Therefore, to increase student desire for learning, parents and instructors must be aware of the reasons for depressive moods in students as well as the elements that affect it (Baber, 2020; Kohoulat et al., 2017; Nur'Azizah et al., 2021).

A permeable learning environment, inspiration and necessitates for learning, wishes and dreams for the future, and a desire to achieve success are some of these metrics "which create learning activities that guarantee the continuity of learning activities and provide learning activities with direction so that the desired outcomes of the formal discipline can be accomplished" (Nur'Azizah et al., 2021; Siddiqi, 2019). External motivation comes from sources other than the student self and can come from both internal and external sources (Fajri et al., 2021). Internal motivation is the outcome of an individual's drive to achieve goals without external support or pressure. For instance, individuals are motivated to learn because they want to learn new things or improve their skills; they will work hard to do so on their own initiative (Aldhafeeri & Alotaibi, 2022). External motivation, on the other hand, results from forces outside the person, such as invites, commands, or compulsion from everyone, such that under such circumstances he ultimately wants to learn. It might be challenging to engage students in learning motivation-boosting activities (Guo et al., 2022). The elements that contribute to students' lack of learning motivation include students learning motivation will be impacted by teachers' methods and approaches of instruction, confusing activities and teaching outcomes, and a lack of relevancy of the material to students' requirements and interests. Previous research, learning motivation positive and significant impact on a permeable learning environment (Guo et al., 2022; Khandan & Shannon, 2021; Li, 2022; Nur'Azizah et al., 2021; Rehman et al., 2020; Siddiqi, 2019).

H6: Learning motivation significant impact on a permeable learning environment.

#### Student engagement and a permeable learning environment

The term “student engagement” is used frequently in college education Guo et al. (2022). Student engagement is a collection of characteristics relating to time on the undertaking, level of work, participation, educational and social cohesion, as well as concepts of best practice in college education, as noted by (García-Martínez et al., 2021; Korpershoek et al., 2020). Khandan & Shannon (2021) characterized student engagement as an academic ideology that is naively accepted and strives to incorporate everything into education and learning. The behavioral viewpoint, which emphasizes students' behavior, commitment, and actions, is the viewpoint on student participation that is most frequently acknowledged in the research on a college education (García-Martínez et al., 2021). The primary tenet of this viewpoint is the claim that students will benefit more from their college experience if they put more time and effort into things that have educational value. Multiple studies in educational settings have shown that identity and personality are linked to student involvement, encourage participation, and have a positive impact on students in the form of high success and fulfillment (García-Martínez et al., 2021; Khandan & Shannon, 2021; Korpershoek et al., 2020; Lizzio et al., 2002; Rehman et al., 2020; Smiderle et al., 2020).

Learning, educational contact, questioning, discussion, group learning, integrating what they have learned in other settings, etc. are some of these responsibilities. In the past few decades, a sizable number of studies have shown the beneficial connection between students' engagement and their permeable learning environment, particularly determination Khandan & Shannon (2021), the growth of reflective practice Guo et al. (2022), scores, and other factors. According to Guo et al. (2022), student engagement relates to the features of student commitment that can be observed, such as compliance with rules, presence in class, and completion of teacher-assigned activities. Monitoring students' reading time is a crucial component of contextual performance because it helps determine how much the educational outcomes are influenced by the choices individuals make after enrolling in college or by their upbringing and other circumstances before they start college. Another crucial component of student engagement is attending class (García-Martínez et al., 2021; Guo et al., 2022; Khandan & Shannon, 2021). Students are required to attend the bulk of their sessions, where information is presented and a complete guide about the subject to learn and abilities to practice are given, in order to achieve high-quality academic results and provide a permeable learning environment (Almasri, 2022). Learning activities that guarantee the continuity of learning activities and give learning activities direction so that the desired outcomes of the formal discipline can be achieved are created by a permeable learning environment, inspiration and needs for learning wishes and dreams for the future, and a desire to succeed (Baber, 2020; Nur'Azizah et al., 2021; Siddiqi, 2019).

H7: Student engagement significant impact on a permeable learning environment.

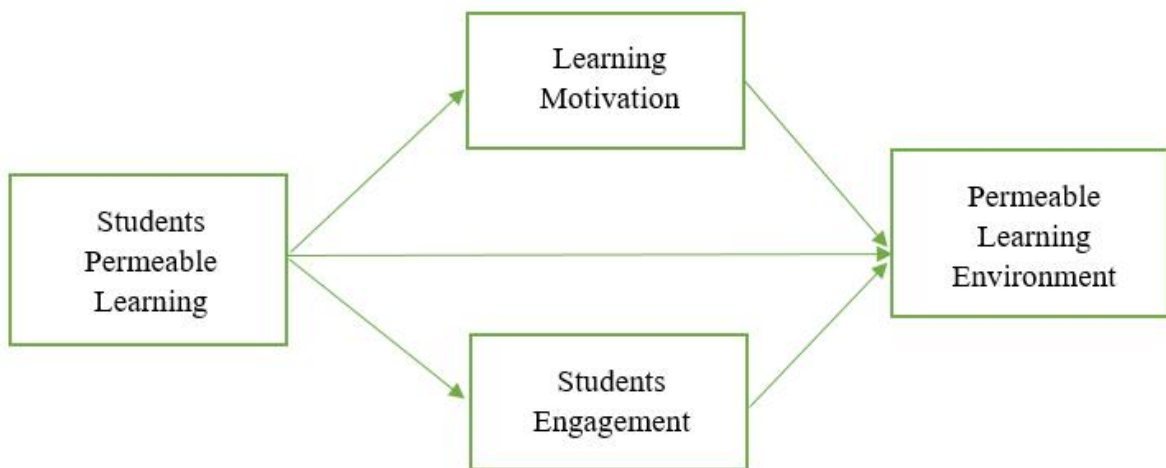


Figure 1. Conceptual Model

The framework we developed using the mentioned components is shown in Figure 1.

## **Methodology**

Self-determination theory was used to create the study's conceptual framework and its assumptions. In Chinese colleges, the study identifies the function of permeable learning environments, the influence of the physical environment on fostering student learning and engagement, as well as the function of learning motivation and student engagement as mediators. All of the students are from China and are fluent in the Chinese language. Additionally, we adhered to moral standards and got approval from families, students, instructors, and the admin staff of the college. Initially, the admin staff, Principals, and teachers approved. Through a face-to-face survey, an invitation to participate, and a brief explanation of the study's objectives, these researchers collected data. This research used non-probability sampling based on a useful sampling approach due to the size and context of the investigative process. China's 420 college students will provide the information.

### **Participants**

The present study makes use of close-ended questionnaires, cross-sectional research, and quantitative approaches. The participants in the research are music-loving college students from China who seek out having to cut studies. Following the necessary departmental approval, a cover letter and questionnaire survey were sent to each contact to solicit their volunteer participation in this research. After that, the survey was conducted in person. So because the poll was held in English, respondents were also requested to provide information about their language proficiency in the cover letter. Additionally, all respondent responses were kept completely confidential, and only the study's overall findings were made public. Some Chinese colleges were initially excluded because of a language barrier and time constraints. According to the researchers, 420 individuals involved gave their assent voluntarily because they felt comfortable with the survey's wording. Between November 1 and December 1, 2022, data were collected. Due to a lack of time, the researcher decided to terminate data collection after 420 questionnaires had been completed. For the study, 420 thorough and insightful survey responses from various Chinese institutions were gathered, with a 78% overall response rate. The sample for the study was chosen using a comprehensive, deliberate selection procedure. By "a method of collecting samples by capturing samples that are conveniently available close to a location or Internet service" (Sarstedt et al., 2022). Using the PLS-SEM Smart PLS 3 method, the data are analyzed and the following hypothesis is assessed in this research (Baghaei & Ravand, 2016).

### **Measurement Scale**

A 19-item questionnaire was devised to determine the role of the student's permeable learning in the permeable learning environment as student's engagement and learning motivation as a mediator adoption in China, as well as established own self-determination theory involved.

Student's permeable learning includes "The course provides the chances for me to express my opinions and the course offers the opportunity for me to interact with fellow students formally (e.g. face-to-face discussion" adopted by (Smiderle et al., 2020). Learning motivation includes "I am motivated when I can complete the tasks distributed in the course successfully and I am motivated when I can complete the tasks successfully" adopted by (Rehman et al., 2020). Student engagement includes "I discuss my study plan with a faculty member and when studying, I often try to generate my own opinions" adopted by (Khandan & Shannon, 2021). A permeable learning environment includes "Expressing positive expectations and seeking to motivate students to do their best and provide feedback on progress" adopted by (Nur'Azizah et al., 2021).

## **Results**

Descriptive statistics of the demographics for the present study (N=415) were produced based on the evaluation of measurement values. SmartPLS3 was used to assess the structural and measurement models.

### **Demographics**

The consequences of current studies on the effects of permeable student learning on permeable learning environments, the mediating role of learning motivation and students'



engagement in college education, as well as the self-determination theory that has been around for a while, are included in Table 1 along with demographic data. The gender, age, and educational status of Chinese college students were shown to be the three most crucial variables.

Table 1. Demographic profile

Demography	Description	No. Of Responses	%
Gender	Male	250	60
	Female	165	40
Age	14-25	230	55
	Above 25	185	45
Education	1 <sup>st</sup> and 2 <sup>nd</sup> Year	190	46
	3 <sup>rd</sup> and 4 <sup>th</sup> Year	150	36
	BS	75	18

(60%) of the pupils in the table above were male, and (40%) were female. (55%) of college students were between the ages of 14 and 20; (45%) were over 25. First- and second-year college students made up (46%) of respondents, third- and fourth-year college students (36%), and BS college students (18%) in China.

#### Measurement model

In the present study, structural equation modeling with partial least squares (PLS) was employed to gauge the model's progress. Smart PLS was employed to conduct this measurement. The “average variance extracted (AVE), confirmatory factor analysis (CFA), convergent validity, and discriminant validity” are all considered in this quality measure. PLS analysis uses two primary criteria: validity and reliability (Sarstedt et al., 2022). This is because the main objective of model measurement is to estimate the model's quality. To ensure that the construct under inquiry is valid, both convergent and discriminant validity assessments were performed. Convergent validity, also known as internal consistency of the variables, was tested using the average variance extracted (AVE) values and item loading values. In this convergent validity analysis, the items' reliability was assessed.

#### Composite Reliability and Validity

Additionally, PLS-SEM was used to assess the factor loadings, validity, and reliability of the data collected from 390 students. Table 2 provides specific information on the item factor loading, validity, and reliability of the PLS measurement model. To assess an item's internal consistency, Cronbach's alpha test value, which must be 0.70 or higher, is generally utilized (Baghaei & Ravand, 2016). For the variables under examination, Cronbach's Alpha and CR values were both greater than 0.70. Convergence validity and high reliability were shown because the average variance extracted (AVE) values for discriminant validity were higher than 0.50 (Fornell & Larcker, 2014). The CR values were over the threshold range of 0.70, ranging from 0.925 to 0.870.

Table 2. Composite reliability, Cronbach's Alpha and AVE values

Construct	Item	Loadings	CA	CR	AVE
STUDENTS PERMEABLE LEARNING	SPL1	0.783	0.841	0.893	0.675
	SPL2	0.864			
	SPL3	0.826			
	SPL4	0.812			
LEARNING MOTIVATION	LM1	0.753	0.844	0.885	0.563
	LM2	0.754			
	LM3	0.795			
	LM5	0.777			
STUDENTS ENGAGEMENT	LM6	0.731	0.892	0.925	0.754
	SE1	0.859			
	SE2	0.884			

Construct	Item	Loadings	CA	CR	AVE
	SE3	0.880			
	SE4	0.850			
PERMEABLE LEARNING ENVIRONMENT	PLE1	0.818	0.800	0.870	0.662
	PLE2	0.831			
	PLE3	0.726			
	PLE4	0.785			

“Note: CR=composite reliability; AVE=average variance extracted; CA= Cronbach’s Alpha”

Other than “LM1, LM4 and LM6”, Table 2 shows that there is no issue for any other variables. Remove any indicators with outside loadings of less than 0.40 from the structures (Sarstedt et al., 2022). The external loading of lower-order structures was investigated using a PLS-SEM method. The findings demonstrate that all builds have Cronbach's Alpha values greater than 0.789. All survey measurements result in a high degree of precision. The measurement model is valid since the average variance extracted (AVE) exceeds the cutoff value of 0.50.

#### Discriminant Validity

Each research strategy must also prove its discriminant validity. One predictor variable's discriminant validity explains how it differs from some of the other latent components (Fornell & Larcker, 2014). The related factor variability, AVE value, and other range of fundamental values should all be lower than the AVE value of the independent factors in order to evaluate the discriminant validity (Sarstedt et al., 2022). A notion is validated by discriminant validity, which involves contrasting it with other constructs. We conducted extra research for structural analysis as soon as we were certain that the variables' reliability and validity met all requirements. The discriminant validity is further supported by the HTMT results below in Table 3.

Table 3. Discriminant validity

	LM	PLE	SE	SPL
LEARNING MOTIVATION	0.751			
PERMEABLE LEARNING ENVIRONMENT	0.727	0.791		
STUDENT ENGAGEMENT	0.669	0.711	0.868	
STUDENT’S PERMEABLE LEARNING	0.727	0.702	0.614	0.822

#### R Square

In this investigation, the researcher used Smart PLS 3.0 as a tool. The main regression model, or R square, will be discussed first in this study before the inverse relationship is taken into account. According to, R<sup>2</sup> values of 0.13 should be viewed as weak, 0.33 as moderate, and 0.67 as strong. The Table 4 displays the variable estimate determining coefficients. The table below shows the R square value of learning motivation at (0.529), the permeable learning environment at (0.738), and the student engagement value of R square value at (0.377) (Figure 2).

Table 4. Assessment of R square

	R <sup>2</sup>
Learning motivation	0.529
Permeable learning environment	0.738
Student engagement	0.377

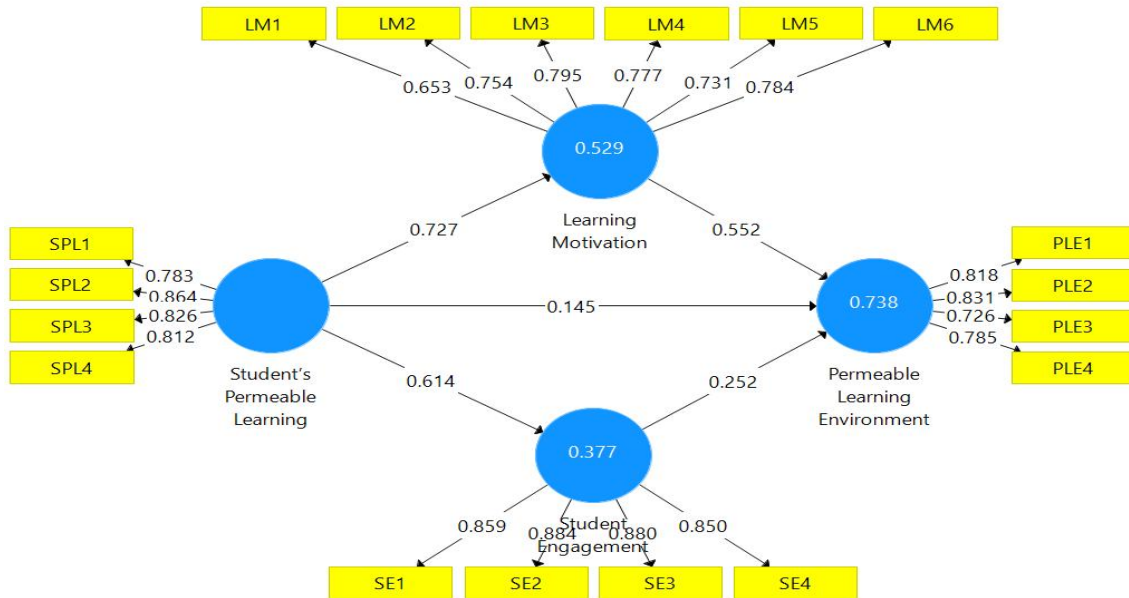


Figure 2. Assessment of Algorithm

Structural Equation Model

Using a PLS-SEM bootstrapping method, the structural model route coefficients representing the hypothesized correlations were statistically determined. This study provides evidence for self-determination theory as well as the PLS-SEM evaluation of the effects of permeable student learning on permeable learning environments, the mediating role of learning motivation, and students' engagement in college education. Preconceptions, unpredictability, measurement deviation, coefficient of determination, and other parameters are given accuracy ratings for bootstrapping (Baghaei & Ravand, 2016). Almost any statistic that uses the survey method may be estimated using this approach's sample distribution. It can also be used to create tests for hypotheses. When a modeling approach is inaccurate, difficult to use, or necessitates the employment of complex formulas to determine standard errors, an alternative to statistical procedures is typically used (Hair & Sarstedt, 2021).

Direct Relation

The results indicate a relationship link between students' permeable learning and permeable learning environment ( $\beta = 0.145$ ,  $t = 2.171$ ,  $p = 0.030$ ). H1 is therefore acceptable. The results show a relationship between students' permeable learning and learning motivation ( $\beta = 0.727$ ,  $t = 19.207$ ,  $p = 0.000$ ). H2 is therefore accepted. The results show a relationship between students' permeable learning and students' engagement ( $\beta = 0.614$ ,  $t = 11.689$ ,  $p = 0.000$ ). H3 is therefore accepted. The results show a relationship between learning motivation and a permeable learning environment ( $\beta = 0.552$ ,  $t = 9.176$ ,  $p = 0.000$ ). H4 is therefore accepted. The results show a relationship between students' engagement and a permeable learning environment ( $\beta = 0.252$ ,  $t = 4.506$ ,  $p = 0.000$ ). H5 is therefore accepted (Table 5).

Table 5. Direct Relation

	<b>Original Sample</b>	<b>T Statistics</b>	<b>P Values</b>	<b>Decision</b>
Student's Permeable Learning -> Permeable Learning Environment	0.145	2.171	0.030	Supported
Student's Permeable Learning -> Learning Motivation	0.727	19.207	0.000	Supported
Student's Permeable Learning -> Student Engagement	0.614	11.689	0.000	Supported
Learning Motivation -> Permeable Learning Environment	0.552	9.176	0.000	Supported
Student Engagement -> Permeable Learning Environment	0.252	4.506	0.000	Supported

#### Mediating Effect

After adding learning motivation in campus education as a mediating variable, the link between students' permeable learning and permeable learning environment remained significant ( $\beta = 0.402$ ,  $t = 8.267$ ,  $p = 0.000$ , respectively). After adding students' engagement in campus education as a mediating variable, the link between students' permeable learning and permeable learning environment remained significant ( $\beta = 0.155$ ,  $t = 4.136$ ,  $p = 0.000$ , respectively) (Table 6 and Figure 3). In mediation, "the parties meet with a mutually agreed-upon neutral third party who aids them in the discussion of their differences," according to the Hamdollah & Baghaei, 2016).

Table 6. Mediating Effect

	<b>Original Sample (O)</b>	<b>T Statistics</b>	<b>P Values</b>	<b>Decision</b>
Student's Permeable Learning -> Learning Motivation -> Permeable Learning Environment	0.402	8.267	0.000	<b>Accepted</b>
Student's Permeable Learning -> Student Engagement -> Permeable Learning Environment	0.155	4.136	0.000	<b>Accepted</b>

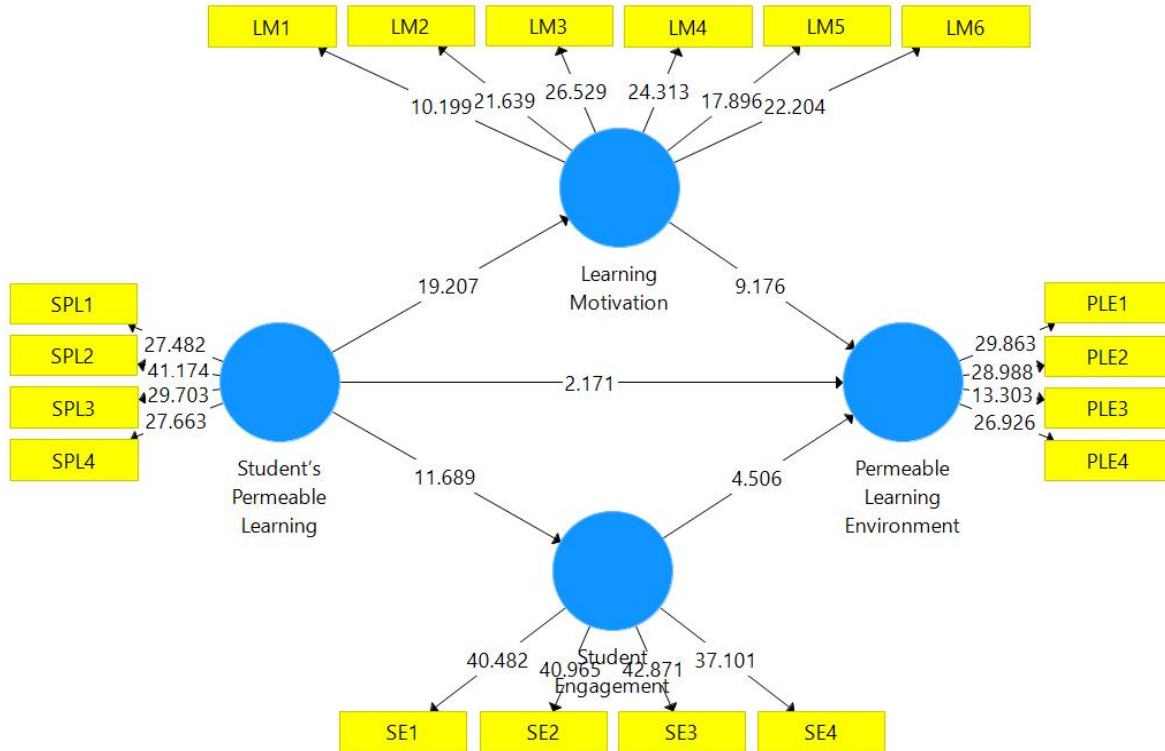


Figure 3. Assessment of Bootstrapping

**Discussion**

This study looks at the impact of students' permeable learning on permeable learning environment as students' engagement and learning motivation as a mediator adoption in China, as well as established own self-determination theory involved.

The impact of students' permeable learning and permeable learning environment is also determined. Since focused student-permeable learning promotes student commitment and a permeable learning environment, college education has increased its emphasis on it across the college environment (Khandan & Shannon, 2021). Parallel to changes in educational paradigms, student diversity, teaching aids, and college budgets, institutional understanding of the importance and value of involved student permeable learning has increased. A range of design components and possible interactive features are revealed through tracking and analyzing permeable usage in contexts related to higher education. The intentional use of permeable design elements enhances and amplifies this adaptive, flexible interconnection of the learning environment (Li, 2022).

The significant impact of students' permeable learning and learning motivation on a permeable learning environment. For instance, individuals are motivated to learn because they want to learn new things or improve their skills; they will work hard to do so on their initiative (Fajri et al., 2021). External motivation, on the other hand, results from forces outside the person, such as invites, commands, or compulsion from everyone, such that under such circumstances he ultimately wants to learn. This demonstrates that the support of the learning environment (in terms of a secure, pleasant, and suitable condition) and student willingness to study do, in fact, play a very crucial part in the reality of the anticipated educational performance.

The impact of student's permeable learning and student's engagement on permeable learning environment. Additionally, a number of researchers have used the self-determination theory (SDT) to examine students' engagement intentions and learning settings (Jeno et al., 2019). Self-determination theory provides a thorough framework for comprehending factors that can strengthen or impair students' motivation for learning in classroom contexts (Ryan & Deci, 2020).

The impact of learning motivation and student engagement significantly mediates the

relationship between students' permeable learning and permeable learning environment. If understanding is thought to be conscience, as suggested by self-determination theory, learning motivation has been considered to be an essential component for task completion. When separating these two concepts, intrinsically motivated to learn a subject for fun and passion for learning, whereas external motivation relates to learning for specific purposes, such as to obtain a stronger situation or rank in the institution (García-Martínez et al., 2021). The association between students' permeable learning and permeable learning environment was found to be mediated by student engagement. Students' permeable learning at colleges was clearly impacted by student engagement. This is in line with research findings that demonstrate the connection between student engagement and results in college, such as better environmental conditions.

### Implications

The findings of this study have theoretical and practical ramifications that can aid future academics and employers in a variety of sectors. This study has a lot to offer administrators, policymakers, and decision-makers. To lessen contributing effects that are unknown, new factors must be investigated. Students should have access to instructional resources, as should academics and specialists. Teachers can use the environmental factors impacting the education process to engage students more fully in learning and enhance their educational achievement. First, it would seem crucial for instructors to be knowledgeable that student work and engagement have an impact on learning, and that assessments of the permeable learning environment may in turn have an impact on student involvement. The study's findings indicate that engagement is a key factor in determining the impact of education. The education should be set up to encourage students to invest more time and energy in academic pursuits like pattern recognition, problem-solving ability, friend and teacher engagement, etc. Second, the definition of permeable learning changed as designers (and other professions) looked for better words to explain how spaces relate to their surroundings, to other environments, and to how people interact with those places. Third, learning motivation increases students' learning levels by creating a positive learning environment, fostering relationships among learners, and extending students' academic potential. These factors may boost students' motivation and assist them in resolving educational objectives. Last but not least, with support from this research, schools must design a learning environment that promotes student involvement. Colleges should place more emphasis on the education system and on initiatives that lead to the desired learning goals rather than on status and budget allocation. It's challenging for students in occupational education and training to move to academic courses or combine them later because they frequently have to concentrate on a youthful children.

### Limitations and Future Recommendation

Even though this study has some positive aspects, such as a participatory action research methodology and a solid theoretical systemization, one flaw is that the sample sizes are tiny, which can pose difficulties for statistical analysis. Despite the study's many serious limitations, new approaches were suggested to address them. Likely, survey respondents don't always give honest answers. Questions could receive a range of responses from students. There are occasions when choices are made without reading the question or all of the responses. The tendency of respondents to conceal information or make rash judgments will often have an impact on the veracity of the statistics. It was challenging to obtain better and more accurate results for this study because of the substantial restrictions caused by the small number of participants. The entire body of study is based on unrelated factors, such as permeable students' learning and permeable learning environment. To make sense of the results, the researcher was compelled to combine and synthesize the data into a plan. To fully comprehend the complicated phenomenon of college students' permeable learning, more research is required. It was the main reason why the sample size was so small. Another restriction is the application of convenience sampling. An extensive population is sampled at random using convenience sampling. The results of the current study are difficult to generalize due to the small sample size, constrained geographic reach, and practical sampling process.

More individuals should participate in the future study, and case studies will be undertaken in creative methods in addition to using questionnaires. Focus groups, surveys, and interviews might have all been used in the study. Face-to-face encounters might make it possible for probing and follow-up to collect information that would be very challenging to uncover with a traditional survey. They can be set up to generate highly useful data.

### **Conclusion**

The results of this study offer insight into the student's engagement in college libraries and have been linked to demonstrable improvements in student success measures, which are crucial to college administrators and may increase the institutions' exposure and value to their communities. While there has been some study linking the utilization of library spaces to initiatives promoting student success, these analyses have not examined the function of permeable learning environment components in those settings. The following elements that contribute to students' lack of learning motivation are teachers' techniques of instruction. Constant and pleasurable teachers' methods and styles of instruction will have an impact on pupils' desire to study. Technologies and informational items are only used by students to fulfill their requirements for enjoyment. Feeling unable of learning particular subjects, such as English and arithmetic. Students' personal issues can involve their families, colleagues, and surroundings. Although the self-determination theory describes motivational variables, motivation in the college environment differs from motivation in other spheres of life. Due to its significant impact on students' engagement to study and ability to provide an open learning environment, it is crucial to consider when studying various aspects of the students learning. Access to traditional education at any level should be encouraged and enabled, but this is just the beginning. Real permeable learning must allow students to apply and build upon all of their existing knowledge, whether it was formal, non-formal, or informal, regardless of whether it was acquired at college, at work, or in their free time.

## References

- Abdulabbosovna, S. M. (2022). Characteristics of organization of accounting in limited. *Gospodarka i Innowacje*, 21, 147-151.
- Aldhafeeri, F. M., & Alotaibi, A. A. (2022). Effectiveness of digital education shifting model on high school students' engagement. *Education and Information Technologies*, 27(5), 6869-6891. <https://doi.org/10.1007/s10639-021-10879-4>
- Almasri, F. (2022). Simulations to Teach Science Subjects: Connections Among Students' Engagement, Self-Confidence, Satisfaction, and Learning Styles. *Education and Information Technologies*, 27(5), 7161-7181. <https://doi.org/10.1007/s10639-022-10940-w>
- Anungstri, R., Petrus, H. T. B. M., & Prasetya, A. (2022). Removal of Sulphate and Heavy Metals from Acid Mine Drainage using Permeable Reactive Barrier Technique. *IOP Conference Series: Earth and Environmental Science*, 1065(1), 1-13. <https://doi.org/10.1088/1755-1315/1065/1/012059>
- Baber, H. (2020). Determinants of students' perceived learning outcome and satisfaction in online learning during the pandemic of COVID19. *Journal of Education and E-Learning Research*, 7(3), 285-292. <https://doi.org/10.20448/JOURNAL.509.2020.73.285.292>
- Ravand, Hamdollah, & Baghaei, Purya. (2016). Partial Least Squares Structural Equation Modeling with R. *Practical Assessment, Research & Evaluation*, 21(11). Available online: <http://pareonline.net/getvn.asp?v=21&n=11>
- Fabiana Meijon Fadul. (2019). Project-Based Learning: Promoting EFL Learners' Writing Skills. *LLT Journal: A Journal on Language and Language Teaching*, 22(1), 78-85. <https://doi.org/doi.org/10.24071/llt.2019.220108>.
- Fajri, Z., Baharun, H., Muali, C., Shofiatun, Farida, L., & Wahyuningtiyas, Y. (2021). Student's Learning Motivation and Interest; the Effectiveness of Online Learning during COVID-19 Pandemic. *Journal of Physics: Conference Series*, 1899(1). <https://doi.org/10.1088/1742-6596/1899/1/012178>
- Fornell, C., & Larcker, D. F. (2014). SEM with Unobservable Variables and Measurement Error. *Algebra and Statistics*, 47(3), 138-145.
- García-Martínez, I., Landa, J. M. A., & León, S. P. (2021). The mediating role of engagement on the achievement and quality of life of university students. *International Journal of Environmental Research and Public Health*, 18(12). <https://doi.org/10.3390/ijerph18126586>
- Guo, J. P., Yang, L. Y., Zhang, J., & Gan, Y. J. (2022). Academic self-concept, perceptions of the learning environment, engagement, and learning outcomes of university students: relationships and causal ordering. *Higher Education*, 83(4), 809-828. <https://doi.org/10.1007/s10734-021-00705-8>
- Hair, J. F., & Sarstedt, M. (2021). Data, measurement, and causal inferences in machine learning: opportunities and challenges for marketing. *Journal of Marketing Theory and Practice*, 29(1), 65-77. <https://doi.org/10.1080/10696679.2020.1860683>
- Hamdollah, R., & Baghaei, P. (2016). Partial least squares structural equation modeling with R. *Practical Assessment, Research and Evaluation*, 21(1), 1-16.
- Iqbal, J., Asghar, M. Z., Ashraf, M. A., & Yi, X. (2022). The Impacts of Emotional Intelligence on Students' Study Habits in Blended Learning Environments: The Mediating Role of Cognitive Engagement during COVID-19. *Behavioral Sciences*, 12(1). <https://doi.org/10.3390/BS12010014>
- Jeno, L. M., Adachi, P. J. C., Grytnes, J. A., Vandvik, V., & Deci, E. L. (2019). The effects of m-learning on motivation, achievement and well-being: A Self-Determination Theory approach. *British Journal of Educational Technology*, 50(2), 669-683. <https://doi.org/10.1111/bjet.12657>
- Keisling, B. L., & Fox, R. E. (2021). Permeable Learning Environments: How Developing Permeability in Library Spaces Fosters Student Learning and Engagement. *New Review of Academic Librarianship*, 27(4), 440-454. <https://doi.org/10.1080/13614533.2021.1906714>
- Khandan, R., & Shannon, L. (2021). The effect of teaching-learning environments on student's



- engagement with lean mindset. *Education Sciences*, 11(9). <https://doi.org/10.3390/educsci11090466>
- Kohoulat, N., Hayat, A. A., Dehghani, M. R., Kojuri, J., & Amini, M. (2017). Medical students' academic emotions: the role of perceived learning environment. *Journal of Advances in Medical Education & Professionalism*, 5(2), 78-83. <http://www.ncbi.nlm.nih.gov/pubmed/28367464><http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC5346172>
- Korpershoek, H., Canrinus, E. T., Fokkens-Bruinsma, M., & de Boer, H. (2020). The relationships between school belonging and students' motivational, social-emotional, behavioural, and academic outcomes in secondary education: a meta-analytic review. *Research Papers in Education*, 35(6), 641-680. <https://doi.org/10.1080/02671522.2019.1615116>
- Li, Y. (2022). Inclusive learning environments can improve student learning and motivational beliefs. *Physical Review Physics Education Research*, 18(2), 20147. <https://doi.org/10.1103/PhysRevPhysEducRes.18.020147>
- Lin, M. H., Chen, H. C., & Liu, K. S. (2017). A study of the effects of digital learning on learning motivation and learning outcome. *Eurasia Journal of Mathematics, Science and Technology Education*, 13(7), 3553-3564. <https://doi.org/10.12973/eurasia.2017.00744a>
- Lizzio, A., Wilson, K., & Simons, R. (2002). University students' perceptions of the learning environment and academic outcomes: Implications for theory and practice. *Studies in Higher Education*, 27(1), 27-52. <https://doi.org/10.1080/03075070120099359>
- Nur'Azizah, R., Utami, B., & Hastuti, B. (2021). The relationship between critical thinking skills and students learning motivation with students' learning achievement about buffer solution in eleventh grade science program. *Journal of Physics: Conference Series*, 1842(1), 1-10. <https://doi.org/10.1088/1742-6596/1842/1/012038>
- Rehman, A. U., Bhuttah, T. M., & You, X. (2020). Linking burnout to psychological well-being: The mediating role of social support and learning motivation. *Psychology Research and Behavior Management*, 13, 545-554. <https://doi.org/10.2147/PRBM.S250961>
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory. *Encyclopedia of quality of life and well-being research*(pp. 68-78). Berlin, Germany : Springer.
- Sarstedt, M., Hair, J. F., Pick, M., Liengaard, B. D., Radomir, L., & Ringle, C. M. (2022). Progress in partial least squares structural equation modeling use in marketing research in the last decade. *Psychology and Marketing*, 39(5), 1035-1064. <https://doi.org/10.1002/mar.21640>
- Siddiqi, A. (2019). Mediating role of students' engagement to their classes: An experience from higher education in Pakistan. *Asian Association of Open Universities Journal*, 13(2), 130-144. <https://doi.org/10.1108/AAOUJ-04-2018-0017>
- Smiderle, R., Rigo, S. J., Marques, L. B., Peçanha de Miranda Coelho, J. A., & Jaques, P. A. (2020). The impact of gamification on students' learning, engagement and behavior based on their personality traits. *Smart Learning Environments*, 7(1). <https://doi.org/10.1186/s40561-019-0098-x>
- Tabroni, I., Lestari, E. S., & Hermaningsih SM, H. (2022). Efforts To Increase Students' Learning Motivation In Al-Qur'an Hadith Lessons About The History Of The Decline And Writing Of The Qur'an With CBSA. *Jurnal Multidisiplin Madani*, 2(2), 795-804. <https://doi.org/10.54259/mudima.v2i2.440>
- Vijapur, D., Candido, C., Göçer, Ö., & Wyver, S. (2021). A ten-year review of primary school flexible learning environments: Interior design and ieq performance. *Buildings*, 11(5), 1-15. <https://doi.org/10.3390/buildings11050183>