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Advancing Student Learning Power by Operating Classrooms as Learning Communities: Mediated Effects of Engagement Activities and Social Relations

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Abstract: Schools are responsible for developing students' learning abilities in order to prepare them for the future. However, learning power was rarely explored in previous studies. This study considered classrooms as a proximal level of influences from ecologically-oriented systems theory and therefore centered on exploring the effects of operating classrooms as learning communities (CaLC) on students' learning power. Learner-centered teaching, which includes the components of inquiry, collaboration, and expression, was used to assess how far CaLC has progressed. It comprises the classroom processes, along with student engagement activities (i.e., inquiry, collaboration, and expression), and classroom social relations. By employing a mediation model, this study aimed to disentangle the effects of classroom processes on learning power. A total of 1478 students from 14 junior high schools in Taiwan participated in the survey. The findings indicate that student perceptions of learner-centered teaching, engagement activities, social relations, and learning power all reached a high-intermediate level. It also found that learner-centered teaching directly affected learning power and exerted indirect effects through engagement activities and social relations. This study contributes to the research on the learning community by providing a more comprehensive analytical framework for detecting the impact of classroom processes. Besides, the three identified components (i.e., inquiry, collaboration, and expression) of CaLC can be a practical guide for the instructional practice of learner-centeredness.

Keywords: classroom process; learning communities; learner-centered teaching; engagement activities; learning power; social relations

Citation: Pan, H.-L.W. Advancing Student Learning Power by Operating Classrooms as Learning Communities: Mediated Effects of Engagement Activities and Social Relations. *Sustainability* **2023**, *15*, 2461. https://doi.org/10.3390/su15032461

Academic Editor: Laura Daniuseviciute-Brazaite

Received: 31 December 2022
Revised: 25 January 2023
Accepted: 27 January 2023
Published: 30 January 2023

1. Introduction

To respond to a fast-changing world, schools shoulder the responsibility of equipping students with the capacity to be lifelong learners. The approach to the development of learning throughout the life span involves not only skills but also dispositions (i.e., attitudes, values, and interests) [1]. The learning disposition implies the drive, energy, and potential toward learning that researchers have explored as the concept of "learning power" [1–7]. Learning power is the personal quality of a lifelong learner. Self-driven learning particularly highlights its significance amidst the COVID-19 pandemic. Therefore, schools are accountable for providing quality education and cultivating student learning power.

Learning power may grow well in situations of complexity [8], so it needs to be nurtured in a supportive ecology. From a socio-cultural perspective, learning is not limited to the sensemaking of individuals; it occurs through interactions with others. The classroom processes, which embrace the quality of relationships and social practices, influence student learning. When conceptualizing learning as constructing knowledge with others, classrooms as learning communities play an essential role in fostering the personal power to learn. Moreover, according to ecologically oriented systems theory, individuals are embedded in and affected by multiple systems, such as the family, school, community, and society [9,10]. The classroom is one of the system's proximal levels. Therefore, it

is essential for teachers to operate their classrooms as learning communities (CaLCs) to promote student development.

Classrooms as learning communities subsume the cognitive and social components. Knowledge building in communities involves the individual and social process [11]. With the theoretical underpinning of social constructivism, teachers manage the classrooms to facilitate student engagement in inquiry and collaboration. Their enactment of learner-centered pedagogy contributes to building an ecology that provokes connections among individuals and constructs collective knowledge. In Taiwan, classrooms as learning communities, introduced by Japanese scholar Sato [12,13], have become increasingly familiar to Taiwanese teachers this decade. In order to promote the approach, Pan et al. [14,15] have indigenized the operational model by identifying the three critical components of inquiry, collaboration, and expression as indicators of CaLC. For years, the indigenized model has been implemented in schools. Investigating the effects of CaLC would assist in scaling up the initiative.

Learning communities provide students with more opportunities for peer interaction and diversified ways of knowing that contribute to students' deeper learning [16]. Student agency is created in classrooms with knowledge-building environments. As students are treated as active learners and allowed to collaborate, they are more engaged and have increased relatedness [11,17,18]. They also enhance their awareness of themselves as learners [3]. Furthermore, the more students participate in knowledge construction collaboratively, the more motivated they are to work on problems and express their interests in learning [19]. Another contributor is social relations. They influence how learners learn, think about themselves as learners, and perceive their energy for learning [3].

To sum up, it is teaching practice, student engagement activities, and classroom social relations that comprise classroom processes influencing student learning. Besides, teaching practice has a role in facilitating student engagement and classroom interactions. As a result, the purpose of this study was to investigate how the CaLC approach to learner-centered teaching benefits the enhancement of student engagement activities (i.e., inquiry, collaboration, and expressing themselves), classroom social relations, and, ultimately, students' learning power. The analyses also assessed if engagement activities and social relations mediated the effect of learner-centered teaching on learning power. Junior high school students in Taiwan were used as the sample for investigation. Implementing the study aims to make contributions in two aspects. The first is to enrich the analytical horizon of community research by incorporating the theoretical perspective of ecologically oriented systems. Second, the inclusion of different facets of classroom processes to examine their relationships with learning power provides a more comprehensive framework to assess the effects of classrooms as learning communities.

2. Conceptual Background

The following section begins by examining the relevant literature pertaining to the conceptual variables under investigation in this study. The research questions are then presented.

2.1. Classrooms as Learning Communities: Learner-Centered Teaching and Engagement Activities

The nature of teaching and learning has undergone a dramatic change in the last few decades. Learning is a social act, so the criteria for judging teacher effectiveness are to create the classroom as a learning community rather than deliver knowledge [20]. Drawing on constructivism, the classroom as a learning community characterizes itself in two ways. One is to operate the classroom as a social community, and the other is to engage students in real work [21].

Research and practice on operating classrooms as learning communities have spread in North America, continental Europe, and the East [11]. In Japan, Sato [12,13], based on Dewey and Vygotsky's theories, promotes the learning community approach. He advocates the creation of co-learning and mutually beneficial relationships in the classroom. Only teachers who adhere to the principle of "teaching less, learning more" can return the

learning rights to the students. Students in the educational environment learn to listen, raise questions, share, and express themselves. They can serve as acknowledgeable others for peers during interactions [22]. Meanwhile, the teacher's role in classrooms is that of a facilitator who connects subject matter with students' lived experiences, arranges experiential or hands-on activities, and encourages discussion and collaboration among students [12–15]. Learner-centeredness characterizes the learning process in classrooms.

To promote the learning community approach introduced by Sato [12,13], Pan and colleagues [14,15,23–25] have indigenized the operational model. They proposed inquiry, collaboration, and expression as three critical components of learner-centered practices that apply to teachers' instruction and student engagement activities. In the classrooms, teachers facilitate students to actively explore an issue or problem, think critically, and take ownership of their learning. They also involve students working collaboratively in pairs or small groups to explore topics or complete projects. In addition, students are encouraged to communicate their ideas, thoughts, and feelings effectively, both orally and in writing. Learner-centered teaching is the means for teachers to operate their classrooms as learning communities. With teachers' facilitation, students would learn and devote themselves to inquiry, collaboration, and expression. These students' engagement activities were used in this study to assess the intermediate student outcome of learner-centered pedagogy.

2.2. Effects of Classrooms as Learning Communities: Social Relations and Learning Power

In addition to engagement activities, social relations were another intermediate outcome of this study. According to ecologically oriented systems theory [9,10], classroom processes are dynamic. Students are exposed to dynamic systems, including multiple levels of influence [26,27]. The classroom is one of the most proximal levels. Interactions and relationships in classrooms occur between students and teachers as well as between students. Positive teacher-student relationships result in a variety of positive student outcomes, such as increasing student behavioral engagement [28,29], social competence [30,31], psychosocial behavior [32], learning motivation [33], executive functioning [34], and academic performance [35,36]. The relationship dimensions of teacher-child relationships, especially in preschool and elementary school, usually look at closeness, conflict, and dependency [37]. Peer interaction is another facet of social relations in the classroom. Substantial research asserts that there is a strong relationship between peer relations and academic achievement [38,39], classroom adjustment [40], and behavioral engagement [29]. The above studies indicate that social relations are associated with student learning and development as they can influence motivation, engagement, and overall academic achievement. When students have a sense of community and feel related in classrooms, they are more likely to be motivated and engaged in their learning. Therefore, this study was interested in exploring social relations, which were measured by peer interactions, student-teacher interactions, and learning climate.

Building classrooms as learning communities aims to enhance collective knowledge to support individual knowledge development [41]. The creation of knowledge is the product of social processes, which is a premise for learning communities. In line with this position, a series of studies proposed the concept of "learning power" [1–7]. Learning power can be understood as "a form of consciousness characterized by particular dispositions, values, and attitudes" toward learning [7] (p. 138). It is a concept related to self-regulated learning. In the literature, "self-regulated learning" refers to a self-directed process in which learners manage and monitor their learning by setting goals, planning, evaluating, and reflecting on their learning [42,43]. Learning power can be understood as the drive, potential, and energy toward learning, particularly self-regulated learning.

After reviewing the literature to identify the variables that influence individuals' capacity and motivation to learn and conducting factor analysis, Deakin Crick and colleagues [5] proposed seven dimensions of learning power: 1. changing and learning: a sense of oneself changing and growing as a learner; 2. meaning-making: connecting what was learned and what was known to make learning personally meaningful; 3. curiosity: an inclination to

probe the things below the surface; 4. creativity: to take risks and to be imaginative, intuitive, and playful while learning; 5. learning relationships: being capable of learning with others and independently; 6. resilience: the perseverance shown when facing confusion, challenges, and failure; 7. strategic awareness: being aware of one's feelings and managing learning processes and strategies.

Learning involves dynamic interactions and is affected by factors present in the sociocultural environment of the learner. The environment described as the learning ecology is "to release the energy for learners to learn and change over time" [3] (p. 27). Teachers can nurture the learning ecology by centering their pedagogical practice on the student as a learner and the process of learning. As a result, students can develop their learning power.

2.3. Classroom Processes Influencing Student Learning

Classroom processes refer to various activities and interactions in a classroom setting. They include how teachers facilitate learning and how students engage with the material and interact with others. The impact of classroom processes has been portrayed in the literature. First, teachers' arrangement of authentic and challenging tasks benefits higher behavioral engagement [44,45]. Second, engaged students are more likely to learn and retain new information. As students learn through interactive activities, group work, and hands-on projects, they experience deeper-level learning [16] and increase engagement [46,47].

Additionally, the quality of the interactions between teachers and students and between students brings about changes in student learning. Teachers' providing feedback and support, encouraging student participation, and building positive relationships with students demonstrate their positive influence on greater student engagement and substantive class discussion [48]. Peer interactions also contribute to student attitude [49] and engagement [29,50]. Students who think their peers will assist them are inclined to be more behaviorally engaged [29,51]. Conversely, negative peer interactions affect children's social, emotional, and behavioral adjustment in the classroom [40,52].

Although previous studies provided empirical support for how classroom processes matter, a considerable body of research merely focused on one facet of classroom processes. They either dealt with teacher-child interactions (e.g., [30,31]) or peer interactions (e.g., [39,40]). This study viewed all classroom processes as interconnected from the developmental systems perspective [9,10]. Therefore, it investigated three facets of classroom processes (i.e., teaching practice, engagement activities, and social relations) and asserted that classroom processes create the learning ecology needed to foster learning [4].

Based on the reviewed literature, an expanded research scope was used to examine the effect of operating classrooms as learning communities. This study, treating learning-centered teaching as an indicator of operating classrooms as learning communities and learning power as an outcome variable, has made several hypotheses to be tested. First, learner-centered teaching, classroom engagement activities (i.e., inquiry, collaboration, and expression), and social relations, as three facets of classroom processes, are the preconditions for student learning power. Second, regarding the associations among classroom processes, learner-centered teaching is assumed to promote students' engagement activities and social relations, and engagement activities benefit social relations. Third, the effect of learner-centered teaching on learning power might be mediated by engagement activities and social relations. Specifically, the research questions addressed are:

1. How do the students perceive learner-centered teaching, their engagement activities of inquiry, collaboration, and expression activities, and classroom social relations?
2. How do learner-centered teaching, engagement activities, and social relations affect student learning power?
3. What are the associations between learner-centered teaching, engagement activities, and social relations?
4. How is the effect of learner-centered teaching on student learning power mediated by engagement activities and social relations?

3. Methodology

The study used a survey design to assess the effects of operating classrooms as learning communities. The CaLC is one of the components of the *Learning Community under the Leadership for Learning* program supported by the Ministry of Education in Taiwan. Based on social constructivism, the CaLC emphasizes encouraging students to inquire, cooperate, and express what they know and think. To equip teachers with the competence to implement CaLC, the program provided them with professional learning workshops and developed brochures and manuals facilitating their conceptual understanding and operational skills. Furthermore, teachers were trained to use big ideas to design learning activities, ask students questions, provoke students to think, provide necessary scaffolding, and give students challenging tasks to prompt their learning to a higher level. They also learned to apply the collaborative learning method in the classroom and build a mutually supportive environment [14,15].

3.1. Sample

The sample for this study consisted of 14 junior high schools participating in the *Learning Community under the Leadership for Learning* program in Taiwan, located in the northern and eastern regions of the country. After two years of participation in the program, students from these schools were administered an online questionnaire to examine the impact of practicing CaLC. A total of 1478 valid responses were obtained, with 52.6% males and 47.4% females. The sample was further broken down by grade, with 43.0% being seventh graders, 43.6% being eighth graders, and 13.5% being ninth graders.

3.2. Instruments

This study used four scales to measure learner-centered teaching: student engagement in inquiry, cooperation and expression, classroom social relations, and student learning power. Participants were asked to respond to statements related to these scales based on their perceptions. This study conducted item analysis and reliability tests and followed Matsunaga's [53] suggestion to conduct principal axis factor analysis with Promax oblique rotation and confirmatory factor analyses to ensure the quality of the instrument. One item was removed as a result. The questionnaire items are listed in Appendix A, Table A1.

For the confirmatory analyses, two types of values were reported: composite reliability (CR) and average variance extracted (AVE). The CR value represents the degree of internal consistency of latent variables, and a value greater than 0.60 is considered preferable [54]. The AVE value represents the average variation in explanatory power of each observed variable compared to the potential variable to which it belongs, and a threshold value of 0.50 was used to determine the quality of the instrument [55].

Learner-centered teaching. The assessment of teacher practice in learner-centered teaching was drawn from constructivist theories [22,56,57], Sato's [12,13], and Pan et al.'s [14,15] theoretical analysis of learning communities. There were six items with a six-point Likert-type scale designed, such as "The teacher designs hands-on activities for us to participate in class," "The teacher is mindful of the seating arrangement in class, which facilitates student sharing and discussion," and "The teacher allows us to share our experiences and perspectives in class." The Cronbach's α for the scale was 0.91, the CR value was 0.91, and the AVE value was 0.63.

Engagement activities of inquiry, cooperation, and expression. Teachers facilitate students' ability to inquire, collaborate with peers, and express themselves in classrooms as learning communities [14,15]. This scale was designed with a six-point Likert-type scale. There were 13 items on the scale to measure the extent to which student engagement in inquiry, cooperation, and expression. The sample items are such as "When studying, I use various methods to understand the material thoroughly," "I work with my classmates to discuss and solve study problems," and "During class discussions, I actively express my thoughts and ideas." The Cronbach's α of this scale was 0.94, the CR value was 0.94, and the AVE value was 0.84.

Social relations. Taking Sato's [12,13] and Pan et al.'s [14,15] analyses of learning communities and collaborative learning and the literature discussing classroom social relations [37] as references, this study designed six items with a nine-point Likert-type scale to assess classroom social relations. The items included peer relations (e.g., Overall, my relationship with my classmates is friendly/unfriendly), student-teacher relations (e.g., Overall, my relationship with my teacher is friendly/unfriendly), and class climate (e.g., Overall, the learning atmosphere in our class is active/inactive). The Cronbach's α of this scale was 0.88, the CR value was 0.82, and the AVE value was 0.60.

Learning power. Derived from the concept proposed by Claxton [1,2] and Deakin Crick [3,4], this study developed eight items with a six-point Likert-type scale to measure student learning power. After item analysis, one item was deleted. For the seven-item scale, Cronbach's α was 0.93, the CR value was 0.93, and the AVE value was 0.67. Sample items are "I am motivated when learning something new" and "Various aspects of my life inspire me to learn and grow."

For the four scales developed, Cronbach's α values ranged from 0.88 to 0.94, which were higher than the required value of 0.70. Regarding the results of CFA, the CR values ranged from 0.82 to 0.94, and the AVE values ranged from 0.60 to 0.87. They all met the requirement of having threshold values of 0.60 (CR) and 0.50 (AVE) [55]. In addition, this study has favorable discriminant validity. Table 1 displays that the square root of the AVE of each variable in the diagonal is greater than its contrasting correlation coefficients.

Table 1. Discriminant validity of the main constructs.

	AVE	LCT	EA	SR	LP
LCT	0.63	0.80			
EA	0.84	0.67	0.92		
SR	0.60	0.48	0.52	0.78	
LP	0.67	0.63	0.81	0.56	0.82

3.3. Data Analysis

The AMOS 24.0 software was used to conduct statistical analyses. The descriptive statistics and correlations were first analyzed, followed by structural equation modeling. Four indices were presented to assess the model's fit. They included the root mean square error of approximation (RMSEA), the comparative fit index (CFI), the Tracker-Lewis index (TLI), and the standardized root mean squared residual (SRMR). This study applied the criteria of CFI $\geqq$ 0.90, TLI $\geqq$ 0.90, RMSEA $\leqq$ 0.08, and SRMR $\leqq$ 0.08, as suggested by Schreiber et al. (2006) [58], to judge the fitness of the model. Moreover, a bootstrapping method was utilized that resampled the data 5000 times at a 95% confidence level to determine the significance of the indirect effects and parameter estimates.

4. Findings

4.1. Descriptive Statistics and Correlations

Table 2 presents the descriptive statistics of the investigated variables. The mean scores of learner-centered teaching, student engagement activities, and learning power were 4.44, 4.12, and 4.27 on a six-point Likert-type scale, respectively. Those scores reached a high-intermediate level. Further examining the separate engagement activities, we found that inquiry had the lowest mean score (M = 3.88), followed by expressing oneself (M = 4.18) and collaboration (M = 4.29). It suggests that when classrooms were run as learning communities, students found it easier to collaborate. Regarding social relations in the classrooms, we acquired a moderately high score (M = 6.75) on a nine-point Likert scale. Peer relations were rated higher (M = 6.90) than teacher-student relations (M = 6.69) and the climate of learning (M = 6.65). The correlations among the variables were positive, ranging from 0.41 to 0.74.

Table 2. The means and correlation matrix.

	M	SD	1	2	3
1. Learner-centered teaching	4.44	1.01			
2. Engagement activities	4.12	0.98	0.62 ***		
Inquiry	3.88	1.10			
Collaboration	4.29	1.06			
Expression	4.18	1.07			
3. Social relations	6.75	1.50	0.41 ***	0.42 ***	
Peer relations	6.90	1.77			
Teacher-student relations	6.69	1.79			
Climate of learning	6.65	1.85			
4. Learning power	4.27	1.01	0.59 ***	0.74 ***	0.46 ***

*** $p < 0.001$.

4.2. The Effects of Learner-Centered Teaching on Student Learning Power

We employed a mediated model to assess the effects of operating classrooms as learning communities. Not only examining the direct impacts of learner-centered teaching on engagement activities, social relations, and learning power, we also assessed how engagement activities and social relations mediated the linkage between learner-centered teaching and learning power. The mediation model is demonstrated in Figure 1. The indices used to judge the model fit have shown satisfactory results (RMSEA = 0.05, CFI = 0.95, TLI = 0.95, SRMR = 0.05).

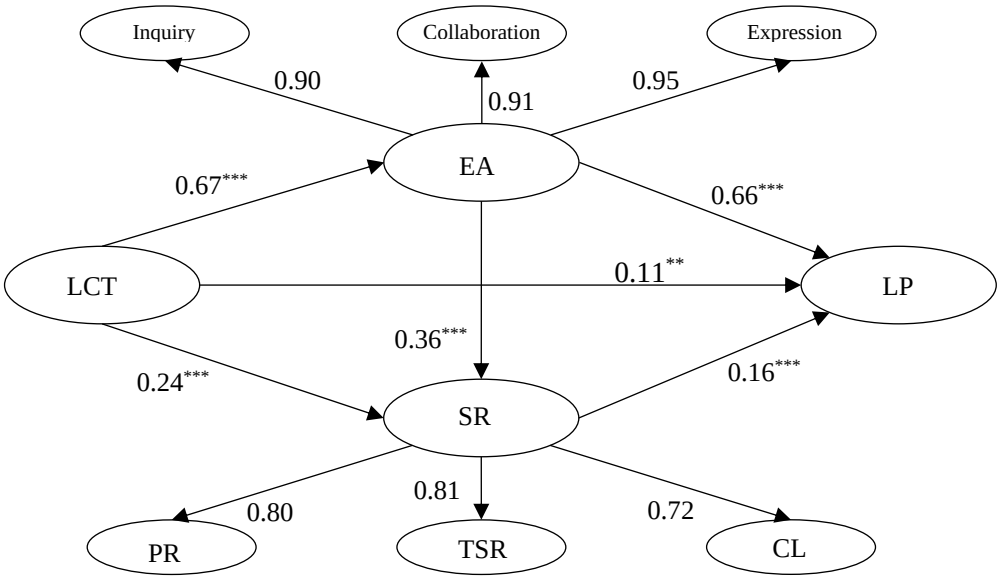

Figure 1. The path coefficients of the structural equation model, ** $p < 0.01$, *** $p < 0.001$. Note: LCT: learner-centered teaching; EA: engagement activities; SR: social relations; LP: learning power; PR: peer relations; TSR: teacher-student relations; CL: climate of learning.

In Figure 1, regarding the three elements of the learning ecology, learner-centered teaching (β = 0.11, $p < 0.01$), engagement activities of inquiry, collaboration, and expressing themselves (β = 0.66, $p < 0.001$), and classroom social relations (β = 0.16, $p < 0.001$) all exerted positive and significant effects on students' learning power. Engagement activities were the element with the most remarkable interpretive power. Besides, learner-centered teaching significantly contributed to engagement activities (β = 0.67, $p < 0.001$) and social relations (β = 0.24, $p < 0.001$). Engagement activities directly affected social relations (β = 0.36, $p < 0.01$). The model also shows that both engagement activities and social relations played mediator roles in the association between learner-centered teaching and learning power. The findings imply that students' engaging in inquiry, collaboration, and

expressing themselves is a critical condition, followed by social relations, to raise the impact of learner-centered teaching on learning power.

The significance of the mediator's specific indirect effect was tested by the bootstrapping method with a 95% confidence interval. Table 3 shows that learner-centered teaching exerted direct and indirect effects on learning power. Engagement activities of inquiry, collaboration, and expressing oneself, as well as classroom social relations, were significant mediators. Partial mediations were found.

Table 3. Bootstrapping results of standardized indirect effects.

	Point Estimates	Product of Coefficients		Bootstrapping		
				Percentile 95% CI		*p*
		SE	Z	Lower	Upper	
Indirect effect	0.52	0.05	11.15	0.44	0.62	0.000
LCT→EA→LP	0.05	0.01	3.29	0.02	0.08	0.000
LCT→SR→LP	0.05	0.01	4.18	0.03	0.07	0.000
LCT→EA→SR→LP	0.62	0.05	13.69	0.54	0.71	0.000
Direct effect (LCT→LP)	0.13	0.05	2.72	0.04	0.23	0.006
Total effect	0.75	0.05	16.20	0.66	0.84	0.000

5. Discussion

Based on the ecologically oriented systems perspective [9,10], this study focused on the influence aroused at the classroom level. The intervention used in schools was learner-centered teaching in classrooms as learning communities. Driven by the teaching practice, student engagement activities (i.e., inquiry, collaboration, and expression) and positive social relations in the classroom occur. This study examined how learner-centered teaching, engagement activities, and social relations, referred to as three facets of classroom processes, affected learning power. Additionally, since teaching practice leads to student learning activities and relationships among individuals in the classrooms, the analysis expanded to how learner-centered teaching affected engagement activities and social relations and then influenced learning power. A mediation model was conducted. Several significant findings are pinpointed and discussed.

First, when teachers endeavored to create the classroom as a learning community, students' perception of learner-centered teaching practice was higher than that of their engagement activities. It indicated that teachers' efforts to design experiential activities, arrange opportunities for sharing and discussion, and encourage students to communicate ideas with others were not translating into student behaviors of inquiry, collaboration, and expressing themselves at the maximal level. Among the engagement activities, working with others was easier to observe in students than actively searching for learning resources and finding different ways to solve problems. It reveals that providing students with the capacity to inquire usually takes longer. Besides, social relations also achieved a high intermediate level, similar to the abovementioned variables. Coherent with the finding that collaboration among students was the one that appeared the most frequently among engagement activities, peer relations scored the highest in social relations, followed by teacher-student relations and learning climate. Student learning power also reached a moderately high level of performance, such as being capable of applying what they have learned in the real world, being eager to learn, and not being afraid of learning new things.

Second, regarding classroom processes, learner-centered teaching, engagement activities, and social relations, all of these significantly affected students' learning power. As teachers provided a nurturing environment in which students actively engaged in inquiry, worked with peers, and expressed their thoughts, an optimal ecology was shaped to cultivate learning power. The empirical finding supports what Deakin Crick [4] advocated for the classroom as a learning ecology to trigger students' learning energy. It also added more verification to the literature exploring relationships between classroom processes

and student learning and development [29–31,46–49,51]. In addition, although the teaching practice of learner-centeredness is a driver for student development, students' own engagement in inquiry, collaboration, and self-expression was a more direct contributor to provoking students' willingness and energy toward learning. In other words, in the ecology of classrooms as learning communities, engagement activities were the most influential factor for learning power, followed by social relations and learner-centered teaching.

Third, the more prevalently students devoted themselves to exploring, discussing with classmates, and sharing their opinions, the more positive peer relations, student-teacher relations, and the learning climate were in the classroom. Practicing the classroom as a learning community involves understanding individual and social processes [11]. In knowledge-building communities, students interact with teachers and peers. The interactions are conducive to relationships among people with distinct roles in the classroom. Besides, numerous studies suggest that student engagement varies depending on the learning opportunities teachers provide in classrooms [59–61]. As teachers encourage and harness students to be actively involved in inquiring into problems and working with others, students in this study tended to be engaged in learning activities.

Finally, learner-centered teaching not only directly affected learning power but also exerted an indirect impact via engagement activities and social relations. It was a partial mediation model. Noteworthily, the direct effect was much less than the indirect effect. To reveal the impact of learner-centered teaching, teachers would need to ensure students shift their roles from shallow passive ones to deeper active ones and interact collaboratively with peers.

Although this study presented several meaningful findings, limitations exist. Only junior high schools participating in the *Learning Community under Leadership for Learning* were studied. Other school-level participants can also be investigated. Besides, a cross-sectional design was employed to assess the effect of the intervention. How students change developmentally is beyond the scope of the current research design.

6. Conclusions and Implications

Learning power is a crucial capacity for students to meet the requirements of a future society. This study used a mediation model to assess the effects of learner-centered teaching (an indicator of operating classrooms as learning communities) on students' learning power with the mediators of engagement activities and social relations. There are two main conclusions. First, student perceptions of learner-centered teaching, engagement activities, social relations, and learning power were all at a high-intermediate level. However, teacher enactment of the learner-centeredness score was higher than students' engagement activities. In other words, teaching practices of facilitating inquiry, collaboration, and expression were not fully transformed into students' performances of the engagement activities. It suggests that teachers must make extra efforts to promote students' active roles and facilitate their self-driven learning. Second, learner-centered teaching directly influenced learning power; meanwhile, it had indirect impacts through engagement activities and social relations. An additional finding in the mediation model was that engagement activities were positively associated with social relations.

Several implications for practice and future research are proposed based on the acknowledged limitations and findings. First, the central purpose of schooling is not limited to knowledge acquisition; personal development is also crucial [4]. Since changes in the core work of teaching and learning cannot count on efforts to scale up interventions in schools [62], operating classrooms as learning communities is a more direct way. It is an effective approach to engaging young learners and harnessing thinking, reflection, and relationship-building. In this study, teachers who practiced their classrooms as learning communities demonstrated positive outcomes. Second, the components of classrooms as learning communities (i.e., inquiry, collaboration, and expression) were identified [14,15,23,24] and were used to assess learner-centered teaching. Those components were found to be beneficial to students' learning activities, peer relations, and

learning power. Therefore, "inquiry, collaboration, and expression" can be used to guide the instructional practice of learner-centeredness. Third, since social relations can have a substantial impact on student learning and success, it is vital for teachers to create a supportive social environment in the classroom. Students' active participation in exploration, critical thinking, and effective communication contribute to their sense of community and belonging in this study. Those activities are what teachers can apply in the classrooms. Finally, future studies may explore other samples (e.g., primary school or high school students) and outcome variables beyond this study to expand understanding of the effects of operating classrooms as learning communities. Also, a longitudinal design could be an alternative to tracking students' changes over time.

Funding: This research was financially supported by the Ministry of Education of Taiwan (Grant No. 1036004).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data is unavailable due to privacy or ethical restrictions.

Conflicts of Interest: The author declares no conflict of interest.

Appendix A

Table A1. Questionnaire.

Scales		Questions
Learner-centered teaching (a six-point Likert-type scale)	LCT1	The teacher designs hands-on activities for us to participate in in class.
	LCT2	When faced with learning difficulties, the teacher does not provide the answer directly but instead prompts us to think.
	LCT3	The teacher is mindful of the seating arrangement in class, which facilitates student sharing and discussion.
	LCT4	The teacher allows us to share our experiences and opinions in class.
	LCT5	The teacher encourages us to speak in class, and we are not reprimanded for doing so.
	LCT6	The teacher connects the class content to our personal experiences.
Engagement activities of inquiry, cooperation, and expression (a six-point Likert-type scale)	I1	When learning new material, I take the initiative to ask my classmates or teachers for clarification on any areas I am unsure about.
	I2	I actively seek and study relevant information in addition to the assigned homework.
	I3	In addition to completing assigned homework, I actively work on additional exercises.
	I4	When studying, I use various methods to understand the material thoroughly.
	I5	I actively question and critically evaluate the information presented in the textbook or by the teacher.
	C1	I work with my classmates to discuss and solve study problems.
	C2	I share the knowledge with others when I know the answer.
	C3	When I encounter difficulties in my studies, I ask my classmates for assistance.
	C4	When a classmate is struggling, I take the initiative to offer my help.
	E1	During class discussions, I actively express my thoughts and ideas.
	E2	I am eager to share what I have learned and my questions with my classmates.
	E3	I appreciate hearing different perspectives from my classmates in class.
	E4	I learn best by actively listening to others during class.
Social relations (a nine-point Likert-type scale)	SR1	Overall, my relationship with my classmates is (friendly/unfriendly).
	SR2	Overall, my relationship with my classmates is (cohesive/alienated).
	SR3	Overall, my relationship with my teacher is (friendly/unfriendly).
	SR4	Overall, my relationship with my teacher is (close/distant).
	SR5	Overall, the learning atmosphere in our class is (enthusiastic/cold).
	SR6	Overall, the learning atmosphere in our class is (active/inactive).

Table A1. *Cont.*

Scales		Questions
Learning power (a six-point Likert-type scale)	LP1	After learning, I have improved my understanding and comprehension of the material.
	LP2	After learning, I have a deeper understanding of myself and the world.
	LP3	I am not afraid to try new things and learn new information.
	LP4	I am motivated when I am learning something new.
	LP5	I actively apply what I have learned to real-life situations.
	LP6	Usually, I can acquire new skills and information after some time.
	LP7	Various aspects of my life inspire me to learn and grow.

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