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Engagement Reimagined: Exploring Community Participation in Blended Professional Learning Communities With Top-Down and Bottom-Up Approaches

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Abstract: Teacher professional development is shifting its paradigm, with a growing number of teachers attending blended professional learning communities (B-PLCs). The present study argues that learning engagement (LE) should be of quality, which is indicated by effortfully engaging in community activities or practically playing community roles. A total of 302 K-12 teachers from 11 B-PLCs were invited to complete a survey questionnaire. Two mediation models using the bootstrap method were tested to see if mediation effects with quality learning engagement (QLE) as the mediator existed. As expected, QLE partially mediated the pathway from the satisfaction of need for competence (SNC) to well-being; surprisingly, QLE completely mediated the pathways from SNC to new pedagogical knowledge (NPK) and altruism, indicating its critical role. SNC acted as a critical condition for QLE to manifest its effect in B-PLCs. An unsettled debate is whether teachers benefit more from participating in top-down B-PLCs (TDBPLCs) or bottom-up B-PLCs (BUBPLCs). The 11 B-PLCs were then divided into two groups based on their top-down or bottom-up approaches: TDBPLCs vs. BUBPLCs. A series of *t*-tests were used to compare group differences. More similarities than differences were found between teachers in TDBPLCs and BUBPLCs. Specially, no differences were found in QLE, NPK, altruism, and well-being, but BUBPLCs scored higher on SNC than TDBPLCs. Chi-square tests were also used to examine whether participants in the two groups played different amounts of community roles. Results showed TDBPLCs played more roles than BUBPLCs. It suggests that both top-down and bottom-up approaches were effective in promoting active engagement, advancing teacher knowledge, and deriving similar levels of mutual support and satisfaction. This finding underscores the importance of flexibility, allowing teachers to choose learning approaches that fit their needs and styles.

Keywords: community roles, need for competence, quality learning engagement, teacher professional development, top-down and bottom-up blended professional learning communities

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重新想像社群參與：探索由上而下和由下而上的混成式教師專業學習社群

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摘要：教師專業發展正經歷轉變，越來越多教師參加混成式專業學習社群（blended professional learning communities, B-PLCs）。B-PLCs 結合線上與線下學習，本研究主張良好的 B-PLCs 要先滿足教師增能的需求（satisfaction of need for competence, SNC），在參與歷程中賦予其社群角色或積極參與活動的機會，以達到優質的學習投入（quality learning engagement, QLE）；經由 QLE，教師可能的收穫包含教學新知（new pedagogical knowledge, NPK）、利他與幸福感。本研究以問卷調查 302 名來自 11 個 B-PLCs 的中學教師，建立 QLE 為中介變項的結構方程模型，利用拔靴法測試模型。如假設預期，QLE 部分中介從 SNC 到幸福感的路徑，而 QLE 更完全中介從 SNC 到 NPK 和利他的路徑；SNC 確實是 QLE 的前提要件，二者合力使參與社群教師有所收穫。不過，教師應該參與由上而下或由下而上的 B-PLCs 呢？將這 11 個社群依據運作模式，分為由上而下 B-PLCs（top-down B-PLCs, TDBPLCs）和由下而上 B-PLCs（bottom-up B-PLCs, BUBPLCs）進行比較，發現 TDBPLCs 和 BUBPLCs 在各變項的差異不大。*t* 檢定發現 BUBPLCs 組的 SNC 得分高於 TDBPLCs 組；QLE、NPK、利他與幸福感則沒有差異；另以卡方檢驗檢查發現 TDBPLCs 組在社群扮演社群角色的數量比 BUBPLCs 組多。本研究發現無論是 TDBPLCs 或 BUBPLCs 都能有效促進教師積極參與社群、提升教師知識、並誘發相似程度的滿意度。這凸顯了允許教師依照個人需求和學習風格，彈性選擇專業成長方式的重要性。

關鍵字：社群角色、專業能力需求、優質學習投入、教師專業發展、由上而下和由下而上的混成式專業學習社群

1. Introduction

With the emerging technologies (e.g., artificial intelligence and virtual/augmented reality) and social media, in this post-pandemic era, people are getting more and more used to switching from on-site learning to e-learning (Mastan et al., 2022); teachers are no exception. No longer limited to well-structured, within-school, face-to-face, and discipline-based professional learning communities (PLCs) (Stoll et al., 2006; Vescio et al., 2008), teacher professional development is changing its face. A growing number of teachers attend blended PLCs (B-PLCs) which offer both online and offline learning experience for those in different subject domains, regions, and time zones. However, there is an apparent dearth of research about this emerging mechanism of teacher learning (Trust & Horrocks, 2017).

Regardless of teacher learning occurring in the physical, virtual, or hybrid way, a much-debated question is whether teachers benefit more from participating in top-down

(i.e., formal, professor-guided, government-monitored, or principal-led) or bottom-up (i.e., informal or teacher-initiated) teacher communities (Lantz-Andersson et al., 2018; Macià & García, 2016; Mazon et al., 2020; Parker et al., 2022). This uncertainty could be contributed to the fact that a majority of the documented teacher communities, being face-to-face, online, or blended, was top-down PLCs supervised by researchers or led by principals. So far, we have known much about this mandate type of PLCs, but very little is known about bottom-up teacher-led PLCs. Taken the research gaps together, what is worth exploring is to compare teachers' different learning experiences in top-down B-PLCs (TDBPLCs) and bottom-up B-PLCs (BUBPLCs) so that constructive suggestions could be made for teachers aiming to develop professionally in this era.

A consensus has been reached in the literature that teachers' learning engagement (LE) in communities is of paramount importance (Avalos, 2011; Lantz-Andersson et al., 2018; Stoll et al., 2006; Vangrieken et al., 2017). However, a review of the existing studies that treated LE as a variable revealed two deficiencies. First, quality learning engagement (QLE) has received much less attention than quantity of LE (Ning et al., 2016; Saini & Abraham, 2019). In the literature, LE was often measured by frequencies of behavior, such as how many times teachers engaged in learning activities (Jansen in de Wal et al., 2014) and how many posts/resources they contributed (Zhang & Liu, 2019). The calculation of these behaviors is definitely important, but it fails to address the depth of engagement, which demonstrates personal meaningfulness (e.g., booking on personal calendar) and communal influence (e.g., taking on a community role). Second, it remains sceptical whether LE serves as an outcome or a precedent variable. In some studies, it was treated as an outcome variable (Alwafi et al., 2020; Jansen in de Wal et al., 2014), influenced by preconditions such as internal resources (e.g., motivation and need satisfaction) and external resources (e.g., online technologies and leadership); in others, it was indirectly interpreted or directly treated as a precedent variable, closely related to learning gains such as new teacher knowledge, better teaching practices, and closer interpersonal relationships (Harper-Hill et al., 2022; Power & Goodnough, 2019; Prenger et al., 2017). These conflicting results are implying that LE could be a mediating candidate to influence the relationships between preconditions and optimal learning outcomes; however, empirical evidence is inadequate to support this mediating link. As a result, it is worthwhile to clarify the role QLE plays in teacher communities.

Teaching practices around the world are prescribed by national standard guidelines such as the Curriculum Guidelines of 12-Year Basic Education released in 2014 by the Ministry of Education in Taiwan. These guidelines represent the vision (or goal) that guide teachers as they (re)design curricula (Shulman & Shulman, 2004). For any country that is undergoing educational reform, the successful implementation of the new guidelines lies in the hands of teachers. Therefore, it is necessary to examine the extent to which teachers are prepared to implement the new guidelines, and the first step is to measure how familiar teachers are with the concepts and pedagogies presented in the guidelines or relevant to them. So

far, most studies tended to focus on the sharing of knowledge that teachers already had or on the acquisition of knowledge that emerged from professional dialogues about day-to-day teaching experiences (Vescio et al., 2008). It is necessary to include new pedagogical knowledge (NPK) as a variable to recognize the importance of familiarity with national teaching principles.

The priority of every teacher community is to support teachers to develop their knowledge/skills and reform their teaching practices (Chung & Chen, 2016; Stoll et al., 2006; Vescio et al., 2008). Teachers become learning partners, who break teacher isolation to innovate through the ongoing exchange of social capital (Rehm & Notten, 2016; Vangrieken et al., 2017). This collective pursuit of professionalism cannot be achieved without a supportive social environment full of resources that satisfy teachers' need for competence, one of the fundamental psychological needs delineated in the self-determination theory (SDT) (Ryan & Deci, 2002). According to this theory, need for competence refers to a universal innate tendency to seek challenges with a sense of confidence and to enhance one's skills and capacities with the feeling of effectiveness. When the social environment enables need satisfaction, an effective and healthy functioning of beings is expected. Following this theoretical approach, several researchers investigated the perceptions and performance of participants whose needs were fulfilled in various learning contexts, and found that they demonstrated optimal outcomes in terms of engagement (Power & Goodnough, 2019), acquisition of new knowledge (Aelterman et al., 2013; Hadar & Brody, 2010; Yurkofsky et al., 2019), and well-being (Hobson & Maxwell, 2017; Larson et al., 2019). Although these studies confirmed the positive relationship between need satisfaction and optimal outcomes, they did not focus on the SNC, which has been shown to be the most prominent psychological need for teachers who voluntarily participated in the PLC (Hsiao & Lin, 2022). Given that the goal of most effective PLCs is to enhance teachers' competence (Vescio et al., 2008), it is necessary to examine how SNC, as the sole independent variable, is related to other dependent variables.

PLCs, to some extent, serve as free/open software in which teachers devote their expertise to create and maintain a knowledge-sharing platform for mutual growth which further influences student achievement. A growing number of studies, especially those investigating online PLCs, examined altruistic behaviors in knowledge sharing (H. -L. Chen et al., 2014; Hew & Hara, 2007; Ho & Sung, 2019; Hou, 2015; Tseng & Kuo, 2014). However, little is known about other altruistic behaviors, such as providing social support to others (Chung & Chen, 2016; Hsiao & Lin, 2022) or giving suggestions to help others overcome difficulties (Avey et al., 2011). Therefore, it is worth expanding the scope of investigation from knowledge sharing behavior to other altruistic behaviors involving emotional and practical support. In the literature, altruism was consistently treated as a dependent variable for work engagement (Gupta et al., 2017; Román Calderón et al., 2013); this relationship was followed in the present study.

In summary, three important insights emerge from the review of the literature. First, generally speaking, teachers are participating in two different types of B-PLCs (TDBPLCs vs. BUBPLCs), but the previous studies have

rarely compared them. Second, to complement studies that focused on the quantity of LE, QLE indicated by different degrees of personal importance, is investigated to see how it, as a mediator, is related to other variables. Besides, various community roles are compared to see if differences exist in the two types of B-PLCs (TDBPLCs vs. BUBPLCs). Third, since teachers participate in learning activities primarily because of their need for competence, it is of value to examine whether, after the social context SNC, teachers can function well, indicated by acquiring NPK, exhibiting altruistic behavior, and having well-being according to SDT (Ryan & Deci, 2002). Taken together, the purpose of this study is two-fold: First, it tests the mediating effect of QLE between SNC and three outcome variables (NPK, altruism, and well-being). Second, it compares teachers' QLE and community roles in TDBPLCs and BUBPLCs. The results will contribute to the current understanding of teachers professional development in TDBPLCs and BUBPLCs for the best interests of all stakeholders (governments, principals, teachers, and researchers).

2. The Current Study

To accomplish the purpose of the present study, we analyzed the data through two stages. In the first stage, we aimed to clarify the mediating role that QLE played between SNC and NPK, altruism, and well-being. Three models with a single dependent variable were first tested (H_1 with three sub-models: Model 1a, 1b, and 1c, as shown in Figure 1):

H_1: In PLCs, QLE partially mediates SNC and optimal learning outcomes (NPK, altruism, and well-being) in respective model.

H_{1a}: It is expected that the model fit of Model 1a is acceptable, and that QLE partially mediates SNC and NPK.

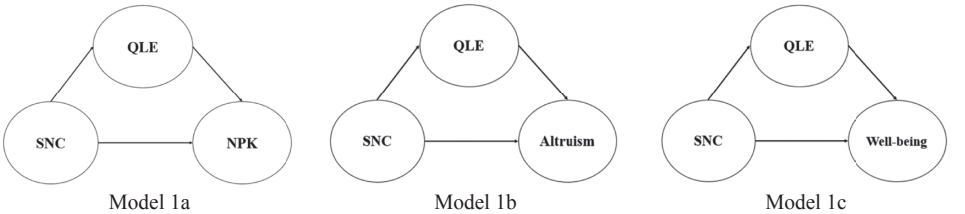
H_{1b}: It is expected that the model fit of Model 1b is acceptable, and that QLE partially mediates SNC and altruism.

H_{1c}: It is expected that the model fit of Model 1c is acceptable, and that QLE partially mediates SNC and well-being.

The three optimal learning outcomes were then placed to the final model (Model 2, see Figure 2) to confirm the mediation effect of QLE:

H_2: When the three dependent variables are included in a model simultaneously, the

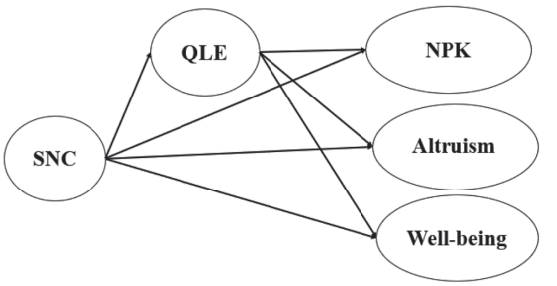
Figure 1.
The structural diagram of mediation models with one single dependent variable, shown as Model 1a, 1b, and 1c. In Model 1a, the optimal outcome is NPK; in 1b, altruism; and in 1c, well-being



Source: Author's own work.

Note. NPK = new pedagogical knowledge; SNC = satisfaction of need for competence; QLE = quality learning engagement.

Figure 2.
The structural diagram of the mediation model with multiple dependent variables



Source: Author's own work.
Note. SNC = satisfaction of need for competence; QLE = quality learning engagement; NPK = new pedagogical knowledge.

model fit is acceptable and significant partial mediation effects of QLE are expected.

In the second stage, we divided the participants into two groups (i.e., TDBPLCs and BUBPLCs) and tested in what way the two groups differed. The answer will help settle the dispute over the choice of attending either top-down or bottom-up teacher communities. As such, we asked a research question: Do differences exist between TDBPLCs and BUBPLCs in the following dimensions: SNC, QLE, NPK, altruism, well-being, and community roles?

3. Methods

3.1 Participants

This study used a snowball method to invite voluntary teachers from 11 different B-PLCs (54.5%: disciplinary; 45.5%: interdisciplinary) in Taiwan. Many studies on teacher communities have been conducted in Western contexts (Avalos, 2011; Hargreaves, 2019; Vangrieken et al., 2017), so including Asian teachers' collegial learning experiences will complement global efforts to strengthen resilience in teachers, schools, and education systems in the face of constant changes and challenges (Naidu, 2021). A total of 322 teachers (77.5%: women) responded to the questionnaire. On average, they had been participating in their teacher communities for 3.4 years (SD = 1.62). More than half of them were experienced teachers who had been teaching for more than 10 years (66.9%). Most were tenured teachers (84.8%), 8.9% were substitute teachers, and 6.3% were part-time teachers. Most of them worked in high schools (89%), 9.3% in vocational schools, and 1.7% in primary schools. Around 87.7% of them taught in public schools, and the remaining 12.3% taught in private schools. Their schools were primarily located in northern Taiwan (61.9%), followed by schools in central Taiwan (23.1%), southern Taiwan (10.3%), and eastern Taiwan as well as offshore islands (4.7%). More than half of them taught languages (65.9%), 9.9% social sciences, 8.6% science, 2.3% mathematics, and 15.2% other subjects.

3.2 Instrument

A web-based questionnaire administered via Google Form was sent to the participants

in the fall of 2020. This questionnaire consists of three parts. In the first part, the participants responded to questions related to their personal information, such as gender, subjects they taught, teaching experience, etc. In the second part, they answered questions related to the communities they joined (e.g., What is the name of the community? How long have you been participating in the community?) and the roles they played in the communities (i.e., pure participant, lecturer, staff, host, and training developer). The community roles were presented in a list and rated on a Yes/No scale. They were defined as an indicator of "quality" LE, as opposed to engaging behavior that emphasizes "quantity" in the literature. These roles revealed different levels of participants' engagement and responsibility in the communities. In the third part, items measuring five latent variables (i.e., independent variable: SNC; mediator: QLE; three dependent variables: NPK; altruism; and well-being) were presented. Since most existing questionnaires measured teachers' engagement and satisfaction of needs at work (Klassen et al., 2012; Shuck et al., 2015), which was very different from the learning environment in B-PLCs, it was necessary to develop scales specifically for the unique learning context. A pilot study was conducted to create items and test the validity and reliability of the scales used in the current study.

3.2.1 SNC

SNC concerns the degree to which participants satisfy their need for competence in PLCs. Four items on the 6-point Likert scale include: "When I converse with community members about teaching, I become aware of my blind spots;" "I apply what I've learned from the community to change my teaching approaches;" "Learning activities in the community are so learner-friendly that I think I can also try innovative teaching;" and "I've been inspired by ideas shared in the community, and my students thus gain different learning experiences." The confirmatory factor analysis (CFA) was performed, and the chi-square test showed an insignificant result ($\chi^2_{(2)} = 2.89$, $p = .24$), with satisfying model fit indices root mean squared error of approximation (RMSEA)= .04, comparative fit index (CFI) = 1.00, standardized root mean square residual (SRMR) = .01). The composite reliability (CR) of the scale was .90, higher than the standard value of .70 (Bagozzi & Yi, 1988).

3.2.2. QLE

QLE measures different degrees of LE (from less engaged to effortfully engaged), reflecting how the participation is personally important. Four items on the 6-point Likert scale include: "I keep track of the learning activities the community holds" (less engaged); "When I know the community holds learning activities (even if the activities occur on holidays or no travel allowance is provided), I will participate in them when I am available" (partially engaged); "I book the learning activities that the community holds in my schedule and I will manage to be there" (engaged); and "I am willing to contribute to the community as a lecturer, host, staff or training developer" (effortfully engaged). The higher the score was, the more quality LE was. The CFA was carried out, revealing a statistically insignificant chi-square test ($\chi^2_{(2)} = 1.92$, $p = .38$) and good model fit indices (RMSEA = .00, CFI = 1.00, SRMR = .01). The CR of the scale was .83.

3.2.3. NPK

NPK refers to participants' familiarity with seven educational concepts (i.e., Curriculum Guidelines of 12-Year Basic Education, Assessment for Literacy, Issue-Based Curriculum Design, Technology-Instruction Integration, Differentiated Instruction, Interdisciplinary Instruction, and Student-Centered Instruction) that were discussed at length in workshops and trainings in Taiwan. These concepts were presented as matrix questions (6-point scale) with the same response options for familiarity (from "I've never heard of it and I don't consider it important" to "I'm familiar with how to implement the idea in teaching"). The measurement model ($\chi^2_{(14)}$ = 37.49, p = .001) showed a fair goodness of fit indices (RMSEA = .08, CFI = .98, SRMR = .02), with CR = .92.

3.2.4 Altruism

Altruism refers to the degree to which participants are willing to help others in PLCs and contribute to PLCs. Four items on the 6-point Likert scale include: "I am willing to help community members because they have helped me;" "I support community members because I understand their struggles;" "Within my capacity, I want to contribute to the community and make it better;" and "I share what I've learned and know with community members, so they can develop professionally." The measurement model ($\chi^2_{(2)}$ = 15.24, p = .001) had good model fit indices (RMSEA = .15, CFI = .98, SRMR = .02), with CR = .85.

3.2.5 Well-Being

Well-being measures the degree to which participants are satisfied with their job, family, and life on the 10-point Likert scale. Participants chose a number between 1 (very dissatisfied) and 10 (very satisfied). No model fit indices were reported, for this scale contained three items, forming a just-identified model; however, the validity of these single-item measures of well-being under different living conditions has been reported in previous studies (Vansteenkiste et al., 2007). The CR of the scale was .83.

3.3 Data Collection and Analysis

To ensure a maximum response rate, the link to the questionnaire was sent to the leaders or core members of several B-PLCs, who then forwarded it to community members from September to November 2020. A total of 303 responses were collected, of which 302 were valid, and the effective response rate was 99.7%.

To transform the categorical variable, community roles, into continuous variables, a panel composed of two experts in team/community behaviors evaluated the significance and impact of the roles. After rounds of discussion, it was decided that "Pure participant" was given 0 point (being a participant was the necessary condition and showed low level of engagement); "Lecturer" 2 points (competent participants were invited or assigned to share their professional knowledge and reflection, which was deemed a demonstration of personal achievement); "Staff" 4 points (reliable participants were responsible for the administrative work which started days and even months before the learning activities took place and continued days and even months later; their continual

effort deserved a higher rating); "Host" 6 points (experienced participants were invited or volunteered to connect lecturers and pure participants by introducing and assisting the lecturers, ensuring the learning activities proceeded smoothly; therefore, their role was considered more impactful), and "Training developer" 8 points (experienced, competent, and reliable participants designed a series of learning activities based on annual goals or the vision of the communities; consequently, they were viewed as the most vital role, given the highest score).

Before the mediation analysis was conducted, the relationship between community roles (teachers' practical LE in B-PLCs) and QLE (how effortful the participants were when they engaged in their communities) was clarified using the correlation analysis. As shown in Table 1, significant positive correlations were found between community roles and QLE (ranging .31 ~ .42). As a result, it was decided to include QLE in the mediation models, because the data contributed by all of the participants was used to build models but most of the participants in the BUBPLCs were pure learners who did not have a prominent role in the community (the number of the community members outnumbered that of the community roles).

For the sake of the mediation analysis, a measurement model using Mplus 7.0 (Muthén & Muthén, 2010) was tested first. For the structural models, the approach of Baron and Kenny (1986) was followed. Three statistical steps of the mediation effect for Model 1 (1a, 1b, 1c) and Model 2 were performed. Bootstrapping (Preacher & Hayes, 2008), a robust nonparametric resampling procedure that does not impose the assumption of sampling distribution normality, was used to test mediation models. This resampling procedure is notable for generating optimal precision of standard errors of indirect effects and the corresponding confidence intervals (MacKinnon et al., 2004; Preacher & Hayes, 2008). According to Gerbing and Anderson (1985), the chi-square test, an absolute fit index, is sensitive to sample size, meaning larger samples increase the chances of rejecting a hypothesized model. To address this, three relative/approximate fit indices were used for model assessment. The first is

Table 1.
Means, standard deviations, and correlations of community roles and QLE in TDBPLCs and BUBPLCs

Variables	*M*	*SD*	1	2	3	4	5	6
1. Community roles	8.28	7.95						
2. QLE	5.28	.82	.31***					
3. Community roles in TDBPLCs	10.89	7.82						
4. QLE in TDBPLCs	5.24	.87			.31***			
5. Community roles in BUBPLCs	5.09	6.89						
6. QLE in BUBPLCs	5.33	.75					.42***	

Source: Author's own work.

Note. QLE = quality learning engagement; TDBPLCs = top-down blended professional learning communities; BUBPLCs = bottom-up blended professional learning communities.

***$p < .001$.

the CFI, which evaluates the "goodness of fit" of the model, with values of .95 or higher indicating a satisfactory fit (Brown, 2015). The other two indices are the RMSEA and the SRMR, which measure the "badness of fit". An RMSEA value below .05 suggests an excellent fit, while an SRMR value below .08 is considered a good fit (Hu & Bentler, 1999; Kline, 2016; MacCallum et al., 1996). To compare TDBPLCs and BUBPLCs, data were processed using PASW 21 to run *t*-tests and χ^2 tests.

4. Results

4.1 Mediation Analysis

Table 2 summarizes the correlations, means, standard deviations, and CR of the five variables. As Table 2 shows, there was a significantly positive correlation between variables, and CR was adequate for each variable (between .83 and .90; acceptable CR = .60, according to Bagozzi and Yi (1988).

Before testing the hypotheses, the five latent variables (SNC, QLE, NPK, altruism, and well-being) were put into a CFA model without structural relationships (measurement model). The result was a significant chi-square value ($\chi^2_{(199)} = 338.22$, $p < .001$), and the goodness fit indicators were acceptable (RMSEA = .05, CFI = .97, SRMR = .04).

4.1.1 Three Mediation Models With Single Dependent Variable

The mediator model with a single dependent variable was tested in three sub-models: Model 1a, 1b, and 1c. A dependent variable was examined at one time to clarify the effect of QLE on pathways from SNC to three outcome variables (In Model 1a: NPK; in Model 1b: altruism; in Model 1c: well-being).

Figure 3 presents the standardized path coefficients and goodness-of-fit index of Model 1a, 1b, and 1c. First, the examination of Model 1a yielded a good fit between the model and the data ($\chi^2_{(87)} = 129.47$, $p = .002$, RMSEA = .04, CFI = .98, SRMR = .04). The

Table 2.
Correlations, means, standard deviations, and internal consistency reliability of factors

Variables	1	2	3	4	5
1. SNC					
2. QLE	.24***				
3. NPK	.11***	.13***			
4. Altruism	.24***	.32***	.14***		
5. Well-being	.29***	.26***	.11*	.26***	
Mean	5.50	5.28	3.71	8.01	5.38
SD	0.67	0.82	0.74	1.33	0.75
items	4	4	7	3	4
CR	.90	.83	.92	.83	.85

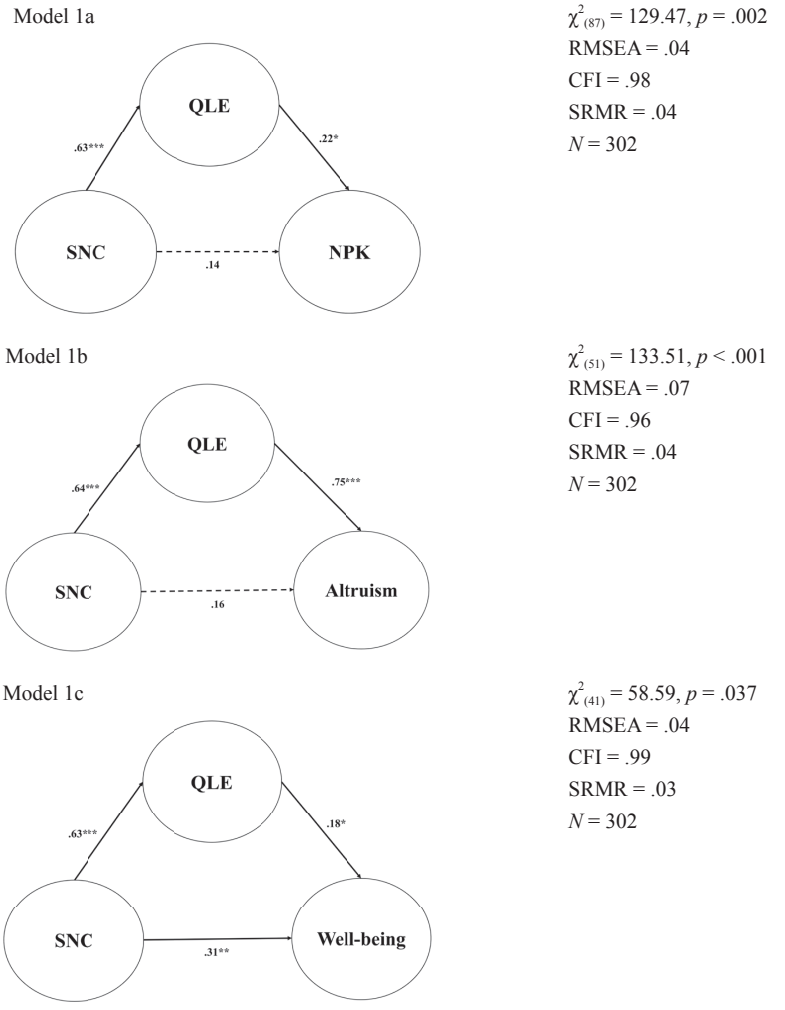
Source: Author's own work.

Note. SNC = satisfaction of need for competence; QLE = quality learning engagement; NPK = new pedagogical knowledge; CR = composite reliability. Six-point Likert scales: SNC, QLE, NPK, and altruism; 10-point Likert scale: well-being.

*$p < .05$, ***$p < .001$.

sum of indirect effect was significant (β = .14, p = .04) and the direct effect was insignificant (β = .14, p = .158), demonstrating a complete mediation effect for QLE between SNC and NPK (rejecting H_{1a}: partial mediating effect). The examination of Model 1b also yielded a good fit between the model and the data ($\chi^2_{(51)}$ = 133.51, p < .001, RMSEA = .07, CFI = .96, SRMR = .04). The sum of indirect effect was significant (β = .48, p < .001) and the direct effect was insignificant (β = .16, p = .061), showing a complete mediation effect for QLE between SNC and altruism (rejecting H_{1b}: partial mediating effect). Third, the examination of Model 1c revealed $\chi^2_{(41)}$ = 58.59, p = .037, RMSEA = .04, CFI

Figure 3.
Standardized path coefficients and goodness-of-fit index of Model 1 (dependent variable in Model 1a: NPK; in Model 1b: altruism; in Model 1c: well-being)



Source: Author's own work.

Note. NPK = new pedagogical knowledge; SNC = satisfaction of need for competence; QLE = quality learning engagement. The dotted line indicates that the effect was insignificant.

$^{*}p$ < .05, $^{**}p$ < .01, $^{***}p$ < .001.

= .99, SRMR = .03, showing an acceptable goodness-of-fit between the model and the data. Although the sum of indirect effect was insignificant (β = .11, p = .104), the direct effect was significant (β = .31, p = .005), which indicates there was a partial mediation effect for QLE between SNC and well-being, supporting H_{1c}.

4.1.2 Mediation Analysis With Multiple Dependent Variables

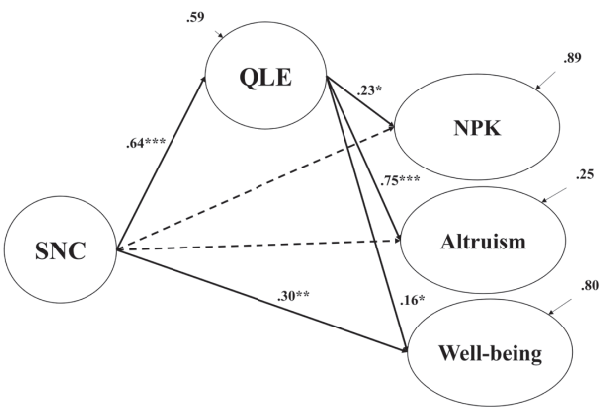
A test of the hypothesized Model 2 (three dependent variables included simultaneously) resulted in a significant chi-square value ($\chi^2_{(199)}$ = 338.22, p < .001) and acceptable goodness fit indicators (RMSEA = .05, CFI = .97, and SRMR = .04). The direct effects of SNC on NPK (β = .13, p = .208) and on altruism (β = .16, p = .064) were insignificant, but the direct effect of SNC on well-being (β = .30 , p = .008) was significant (partially supporting H_2). As shown in Figure 4, unexpectedly, QLE was a significant mediator between SNC and NPK as well as altruism. This was observed in the sum of indirect effects from SNC to NPK (β = .15, p = .029) and to altruism (β = .48, p < .001). All in all, the role QLE played was similar in Model 1 (Model 1a, 1b, and 1c) and Model 2.

4.2 Do Differences Exist Between TDBPLCs and BUBPLCs in the Following Dimensions: SNC, QLE, NPK, Altruism, Well-Being, and Community Roles?

Among the 11 B-PLCs, according to the descriptions that the participants provided in the questionnaire, five of them were categorized into TDBPLCs (N = 166) and six into BUBPLCs (N = 136). To compare the differences between the two community approaches, a series of t-tests and chi-square tests were employed.

To begin with, among the five variables

Figure 4.
Standardized path coefficients of Model 2



$\chi^2_{(41)}$ = 338.22, p < .001
RMSEA = .05
CFI = .97
SRMR = .04
N = 302

Source: Author's own work.
Note. SNC = satisfaction of need for competence; QLE = quality learning engagement; NPK = new pedagogical knowledge. The solid line shows significant relation, whereas the dotted line shows insignificant relation.
$^{*}p$ < .05, $^{**}p$ < .01, $^{***}p$ < .001.

(SNC, QLE, NPK, altruism, and well-being), the only significant difference between TDBPLCs and BUBPLCs was found in SNC (TDBPLCs: M = 5.34, SD = .84; BUBPLCs: M = 5.62, SD = .57; $t_{(291.06)}$ = -3.41, p = .001). That it, teachers attending BUBPLCs were more satisfied with their need for competence than those in TDBPLCs. No difference was found in QLE ($t_{(300)}$ = -0.90, p = .369), NPK ($t_{(300)}$ = 1.52, p = .130), altruism ($t_{(300)}$ = 0.45, p = .651), and well-being ($t_{(300)}$ = 0.82, p = .416), implying that teachers in both community approaches reported similar learning gains.

Next, as Table 3 shows the results of the chi-square tests, across the four community roles, significant differences were found between TDBPLCs and BUBPLCs (Lecture: $\chi^2_{(1)}$ = 6.07, p = .009; Staff: $\chi^2_{(1)}$ = 11.17, p = .001; Host: $\chi^2_{(1)}$ = 10.80, p = .001; Training developer: $\chi^2_{(1)}$ = 64.50, p < .001). Teachers in TDBPLCs were more likely than those in BUBPLCs to take over community roles, and the greatest difference was found in the role as "Training developer" (81.1% vs. 18.9%).

5. Discussion

The results of the present study extend the previous studies in several ways. First, a direct comparison between TDBPLCs and BUBPLCs is rare in the literature. Researchers normally investigated either TDBPLCs (Mehli & Bungum, 2013) or BUBPLCs (Macias, 2017), or advocate complementary interaction between top-down leadership and bottom-up needs (L. Chen, 2022; Petko et al., 2015). Therefore, this study makes a major contribution by comparing TDBPLCs and BUBPLCs and demonstrating two significant findings. Firstly, teachers in TDBPLCs were found taking on various community roles. The finding that most teachers in BUBPLCs were pure learners could be explained by the size of the communities. The investigated BUBPLCs were bulky communities composed of hundreds or thousands of members. It is more than reasonable that only a small group of teachers shared the responsibility of playing the community roles. For the TDBPLCs, on the other hand, since the size of the community is small (less than 20 people), each member, besides being the learner, had to take up a role, oftentimes more than one role. Secondly, although previous studies have found satisfaction in TDBPLCs (Vangrieken et al., 2017), the present study shows that higher SNC was found in the BUBPLCs. This could be explained by the fact that satisfaction in the previous studies was loosely defined as a general pleasant feeling, while the satisfaction in the present study

Table 3.
Results of the chi-square tests

Community role	top-down blended professional learning communities (TDBPLCs) (%[a])	bottom-up professional learning communities (BUBPLCs) (%)	Total	χ^2	*df*	*p*
Lecturer	82 (63.1)	48 (36.9)	130	6.07	1	.009
Staff	98 (64.5)	54 (35.5)	152	11.17	1	.001
Host	66 (68.8)	30 (31.3)	96	10.80	1	.001
Training developer	107 (81.1)	25 (18.9)	132	64.50	1	< .001

Source: Author's own work.

Note. [a]indicates the adjusted mean. % = percentage within the community role.

was psychologically specified as teachers' innate need to improve professionalism. The above two findings suggest that when teachers participate in TDBPLCs, they tend to take on community roles, which sustains the development of the communities; on the other hand, when teachers participate in BUBPLCs, they are more likely to satisfy their needs for competence, improving personal abilities and confidence.

Although differences were found between TDBPLCs and BUBPLCs in terms of community roles and SNC, it is worth noting that no differences were found in QLE, NPK, altruism, and well-being. In other words, whether teachers participated in TDBPLCs or BUBPLCs, they all demonstrated QLE, acquired NPK, showed altruistic motivation, and had the sense of well-being. In other words, the optimal learning outcomes did not vary from one community approach to another. This null difference is meaningful in several ways. Firstly, it suggests that both top-down and bottom-up approaches were effective in promoting active engagement, advancing teacher knowledge, and deriving similar levels of mutual support and satisfaction. This finding underscores the importance of flexibility, allowing teachers to choose learning approaches that fit their needs and styles (Cornelius et al., 2011). Furthermore, the consistency in learning outcomes across two distinct community approaches suggests that the effectiveness of PLCs may be more dependent on other factors such as supportive and shared leadership, shared visions, collegial trust, and shared practices (P. Chen et al., 2016), rather than the specific hierarchical structure of the community. This insight, however, deserves further research.

Previous studies have provided empirical evidence that the SNC is associated with optimal learning outcomes (Ryan & Deci, 2002), but few have investigated the effect of SNC on NPK, altruism, and well-being simultaneously. Furthermore, although previous studies have suggested the importance of QLE (Avalos, 2011; Lantz-Andersson et al., 2018; Stoll et al., 2006; Vangrieken et al., 2017), many studies measured quantities of LE and few examined the mediating effect of QLE. Addressing the deficiencies in the literature, this study clarified the mediating role that QLE plays between SNC and optimal learning outcomes (i.e., NPK, altruism, and well-being) in the context of B-PLCs. The results confirmed that QLE partially mediated SNC and well-being, and completely mediated SNC and NPK as well as SNC and altruism. These findings support the consensus that in teacher communities, continued, autonomous, and active learning leads to greater learning gains (Vescio et al., 2008).

Learning in teacher communities is characterized by collegial support, social cohesion, and mutual trust (Vangrieken et al., 2017). Members share or are willing to share what they have (e.g., time, knowledge, expertise, etc.) to help others overcome challenges and to take action for the goodness of the community. This altruistic behavior/intention has been investigated and considered valuable in teacher communities (Tseng & Kuo, 2014), especially in the Chinese-speaking society (H.-L. Chen et al., 2014; Hou, 2015), from which the participants in the present study came. Most studies, so far, have examined the extent to which altruism is associated with community trust and interpersonal ties; less attention has been paid to the relationship between altruism

and competence (a felt sense of confidence in one's capacities according to SDT; Ryan & Deci, 2002). Tseng and Kuo were among the few to investigate a similar concept, but they used knowledge-sharing self-efficacy to name the construct rather than the SNC that the present study used. Similar to Tseng and Kuo, the results showed that altruism was predicted by SNC; more excitingly, this study extended their study by demonstrating QLE as the underlying mechanism that made this relationship possible. In other words, by actively participating in learning activities, teachers who have confidence in their abilities want to or take real action to help others and support PLCs.

Consistent with our hypothesis, QLE partially mediated the relationship between SNC and well-being. This finding implies that there are other competing variables when it comes to the antecedents of well-being. This result is plausible because previous research has identified other predictor variables (Avsec et al., 2009; Cenkseven-Önder & Sari, 2009; Skaalvik & Skaalvik, 2018) that were not included in the present study due to the focus of the study. As more studies pay attention to teacher well-being and find a link between teacher well-being and student well-being, confirming that professional development in PLCs benefits teachers' well-being becomes meaningful.

6. Conclusion, Implications, and Limitations

The primary goal of all types of PLCs is to satisfy teachers' need for competence (SNC), updating their knowledge/skills and transforming their teaching. One major issue in early research concerned the effectiveness of PLCs (Doğan & Adams, 2018; Vescio et al., 2008), and so far it still remains uncertain whether TDBPLCs or BUBPLCs are more beneficial for teacher professional development. In this study, more similarities than differences were found between teachers in TDBPLCs and BUBPLCs. They reported similar QLE, NPK, altruism, and well-being. However, teachers in BUBPLCs were found more likely to satisfy their need for competence, but teachers in TDBPLCs were more likely to take on community roles. This study also proposed that QLE is the underlying mechanism that leads to optimal learning outcomes, and our data supported our hypotheses. Through QLE, those who SNC acquired NPK, reported altruistic intentions/behaviors, and had well-being.

Our findings have implications for teachers, community/school leaders, and policy makers. Firstly, teachers can clarify their learning goals before deciding whether they should participate in TDBPLCs or BUBPLCs. If they, aside from being pure learners, can spare time and energy to take on community roles (e.g., lecturers, hosts, etc.), they are encouraged to join TDBPLCs. On the other hand, if they have a prominent need to increase their abilities and confidence of teaching, they are more suitable for BUBPLCs. Additionally, teachers should engage in PLCs in a more active way. They are advised to not only book and keep track of all learning activities but also volunteer to take a role in the community. This way, they move closer to the centre of the community and develop commitment

to the group rather than being there as peripheral observers. Secondly, community/ school leaders could encourage QLE in the following ways. First, they could arrange the proper time and place for members to meet, discuss, and collaborate. They could also design activities in which members should help and support each other. They could set up an online platform where members could share resources and pose questions to seek help. Finally, they should gradually release responsibility and allow members to help manage and run the community. Thirdly, it is worthwhile for policy makers to continually invest resources in PLCs, as this mechanism helps implant the vision and knowledge for practice in teachers.

This study has limitations that should be taken into consideration. First, although this study confirmed the mediating role that QLE plays, the different effects of TDBPLCs and BUBPLCs on professional development outcomes remain to be answered. Future work is needed to fully understand the differences between the two approaches or to explore reasons that lead to similar outcomes. Second, due to the limited number of the participants, it is not possible to compare the mediation models of TDBPLCs and BUBPLCs. Future studies are recommended to recruit more participants to verify the hypotheses in B-PLCs that employ different approaches. Moreover, the present study defined well-being general satisfaction with job, family, and life, but over the years, well-being has evolved into an extensive research construct, and different types of well-being such as subjective well-being (Diener et al., 1999), psychological well-being (Ryff, 1989), pedagogical well-being (Soini et al., 2010), and collective well-being (Arcidiacono & Di Martino, 2016), have been proposed and examined. Future studies could further investigate whether professional development in B-PLCs contributes to a particular type of well-being. Finally, only quantitative methods were used to examine the moderating effect of QLE on relationships between SNC and NPK, altruism, and well-being. Although the results are robust enough to generalize to different types of teachers (in terms of subjects, gender, teaching experience, and locations) and learning communities (young or mature; formal or informal; face-to-face, blended, or virtual; disciplinary or interdisciplinary), it is suggested that future studies use qualitative or mixed-methods to gain a more comprehensive understanding of teachers' QLE and its effects on teachers.

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