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How Energy Maintains Social Sustainability of Teachers' Learning Communities: New Insights from a Blended Professional Learning Network

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Abstract: Social sustainability of teacher communities addresses the risk of teacher isolation and low teacher vitality. Blended professional learning networks (B-PLNs) providing online and face-to-face collegial learning are booming in the Web 2.0 era to support teachers in the face of various challenges. So far, what is lacking is a thorough investigation into the process where teachers break teacher isolation, regain their energy, and sustain the life of B-PLNs. The purpose of this case study was to investigate reoccurring topics shared in a sustainable B-PLN for EFL teachers in Taiwan. This B-PLN has attracted over 4600 members online and holds regular learning activities. Participants were interviewed to reflect on their experience in the target B-PLN. Applying content analysis, we generated a two-cycle coding scheme through the lens of self-determination and ego depletion theories. The results revealed that teachers initially joined the B-PLN with low energy, showing prominent need for competence. At the process stage, their energy rose with the need for relatedness noticeably satisfied. Finally, collective vitality of altruism, engagement, empowerment, and positive emotions uniquely emerged. Further, immediate keyword feedback complemented the findings. We argued that the transition from low individual energy to high collective energy demonstrates the social sustainability process of this influential B-PLN.

Keywords: social sustainability; applications of sustainability; blended professional learning networks; content analysis; collective vitality

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1. Introduction

This case study addressed the critical problem of teacher isolation in education at all levels [1]. It has been well documented in the literature that teacher isolation detriments teachers' professional development, health, and well-being [2,3]. Even though there are top-down or bottom-up within-school teacher communities aiming to connect teachers, change teachers' knowledge and practices, transform school systems, and enhance student performance, most of them are performance-oriented and they are prone to perish when the goal or the mission is completed [4]. In other words, teachers are not socially supported in a sustainable way. With the increasing research interest in and growing concern about social sustainability, it is time to shift the paradigm from community performance to community sustainability.

Fortunately, in this Web 2.0 era, blended professional learning networks (B-PLNs) are emerging in a free, flexible, and informal way. There is a widespread educational phenomenon where autonomous teachers coming from different schools become consumers and creators of teacher knowledge shared in the community that exists both in face-to-face workshops and in social media [5,6]. However, the current understanding of this emerging mechanism for professional development (PD) is far from sufficient. There is an urgent need to explore how this unique social context sustains itself with active and

engaged teachers nurtured and developing in it. To bring meaning to the new form of teacher communities, we grounded our study on two complementing theories. One is self-determination theory [7,8] and the other is ego depletion theory [9,10]. Both theories explain how human beings exert energy; the former focuses on how the social context boosts people's energy by allowing them to take volitional actions while the latter highlights how people's energy is depleted because of volitional actions they take to respond to stimuli in the social context. With these two theories, individuals are influenced by the social system, and we argue that the social system is sustained because of changed individuals.

2. Literature Review and Theoretical Framework

This section links B-PLNs to social sustainability and delineates the theoretical framework of self-determination theory and ego depletion theory that are relied on to understand the sustainability of B-PLNs.

2.1. Social Sustainability in Blended Professional Learning Networks

The issue of social sustainability is rarely discussed from the perspective of teacher communities. However, this notion is of critical importance because teacher learning in professional communities is sustainable by nature. Therefore, it is necessary to start by exploring the current understanding of social sustainability. Social sustainability has been defined as a condition, a goal, and a process with various indicator sets [11]. However, there lacks a clear and consistent definition for this new interdisciplinary area of study, and the empirical indicators derived from studies at the local level are not fully theoretically grounded [12,13]. For example, Vallance, Perkins, and Dixon [13] proposed a tripartite theory to understand the structures of social sustainability. In their framework, development sustainability refers to catering to people's needs from tangible (e.g., water and food) to less tangible (e.g., education and equity) requirements; bridge sustainability means changing behaviors to generate a better and more friendly connection between the environment and people; and maintenance sustainability is concerned about social characteristics that people want to maintain or improve in the environment over time. On the other hand, Eizenberg and Jabareen [12] proposed their conceptual framework of social sustainability where *risk* is the fundamental premise and *equality*, *safety*, *eco-prosumption*, and *urban forms* are four interrelated components. In this new framework, *equality* is the recognition of identity, redistribution of resources, and parity of participation; *safety* refers to being safe and staying away from potential harm; *eco-prosumption* represents the responsibility of production and gains; and *urban forms* refers to the desired physical forms of the community. Though these two frameworks capture critical components relevant to social sustainability, the underlying mechanism that propels the sustainability of a social context remains obscure. Not to mention, there are various forms of social contexts, each of which has ownership of its needs and interests [11].

According to the document of UK Sustainable Communities, a sustainable community is a place "where people want to live and work, now and in the future. They meet the diverse needs of existing and future residents, are sensitive to their environment, and contribute to a high quality of life. They are safe and inclusive, well planned, built and run, and offer equality of opportunity and good services for all" [14] (p. 50). In this definition and together with others, many social characteristics of social sustainability have been documented [9]. Among the various indicators, diversity, well-being, social networks, social interaction, community cohesion, equality, and safety were pertinent to teacher communities established to enhance teacher professionalism and student learning [15]. However, so far, there has been a dearth of research investigating teacher communities from the lens of social sustainability. We have accumulated characteristics of successful communities [4] but we know little about how to maintain this success.

Professional learning networks (PLNs) refer to learning communities which satisfy members' individual needs and whose members break the boundaries of organizations, geography, and professions [5,6]. Members function as agents of the learning system where

interpersonal connections make it complicated and resourceful. Web 2.0 sites and social media platforms boost the applicability and accessibility of PLNs and create an emerging form of teacher communities—blended professional learning networks (B-PLNs). They are run in both the virtual and the real worlds. With the Internet, teachers are no longer limited by temporal and spatial constraints; with face-to-face interactions, they still feel a sense of community cohesion.

Trust, Krutka, and Carpenter [6] created a qualitative online survey to examine the value of PLNs and their influence on teaching and learning. Several insightful findings shed light on this study. First, when teachers described their PLNs, they mentioned specific people or identified types of people who brought to the community abundant resources and diverse perspectives. Second, they remarked on why they participated in PLNs and how they were supported and helped by all the other members. In other words, motivation activated engagement behaviors and engagement behaviors brought about a sense of empowerment and altruism. Third, they felt burned out and stuck in real life but after they participated in PLNs, they felt "energized" and "invigorated". This rekindling of energy transformed their static attitude toward teaching. They started to try innovative teaching and even when failures occurred, they kept their confidence. Also, they described how PLNs helped them overcome teacher isolation and reach out to teachers who shared similar beliefs and had various resources. They connected, communicated, and cooperated. This reciprocal interaction and cooperation brought empowerment to their profession. In addition to social benefits, cognitively, participants in the survey reported that they acquired new knowledge and skills that changed or modified how they taught. In summary, for ongoing cognitive development to occur, teachers need a strong social network that can support them with both practical and affective resources.

The B-PLN under investigation was selected due to its uniqueness. While most documented teacher communities were molded by top-down forces (i.e., school-initiated teacher communities to implement educational policies or expert-supervised teacher communities to examine the effects of experimental interventions), this B-PLN undertook a bottom-up approach. Two English teachers in a senior high school initiated this B-PLN in 2014 with a clear vision to professionally develop and increase well-being with other English teachers near its birthplace, a city in northern Taiwan. Throughout the years, its influence has swept across the nation. Not only K-12 teachers but also cram school teachers and educators at colleges travel long distances to attend its monthly and annual learning activities. Three times a month, around 40 English teachers assemble either online or in-person to attend learning activities like lesson preparation, keynote speeches, hands-on workshops, study clubs, public teaching, etc. Every year, more than 200 English teachers gather to present their lesson designs, reflect upon their teaching, and exchange ideas on selected topics. Its popularity is also shown by more than 4600 English teachers registering online to post articles, share resources, and interact with one another on a Facebook group. This PLN is not confined to a limited number of members inside "closed doors" [16] (p. 313) but an open and loosely-structured community that embraces anyone who wants to learn more about English language teaching and learning, regardless of their teaching experience and job position.

However, the voice from bottom-up communities such as the target B-PLN in the present study is rarely heard in the literature. The literature is dominated by within-school teacher communities managed by the administrative power of principals or cross-school teacher communities designed and supervised by researchers. However, it is bottom-up teacher communities that harness the strength of the current open and free Web 2.0 era, where sharing and collaboration turn knowledge consumers into knowledge creators. This co-creation of teacher knowledge is visible in various learning activities hosted by the present B-PLN, but the underlying mechanism that propels its energy (vigor or vitality are used interchangeably hereafter) and sustains its network remains obscure and is worth exploring.

It has been suggested by previous studies that energy is the underlying force of social sustainability. In the following sections, we reviewed two complementing theories (i.e., self-determination theory and ego depletion theory) relevant to vigor (or energy and vitality) to explore how social sustainability as a condition, a goal, and a process is achieved in a mature and sustainable B-PLN. These theories served as the lens through which we brought meaning to the first-hand data so as to shed light on the present blurred understanding of social sustainability.

2.2. Self-Determination Theory

According to self-determination theory (SDT) [7,8], what makes people develop and function differently resides in contextual factors. It has been hypothesized that for individuals' optimal development to occur, social environments should allow fulfillment of three fundamental needs for autonomy, competence, and relatedness. *Autonomy* is defined as acting at one's will. When people are offered with choice and freedom, they tend to feel a sense of volition and ownership of their lives. *Competence* refers to feeling effective and confident in one's performing capacities. A competence-supported environment provides people with tools and feedback with which they can upgrade their current abilities and form a sense of confidence and effectiveness. As for *relatedness*, it is people's innate integrative tendency of being accepted by others and a sense of belongingness exemplified in relationships with others and community involvement. With needs satisfied in the social context, people can demonstrate vigor and function with health and well-being.

Self-determination theory has been widely applied to workplace and learning environments. Researchers documented many positive outcomes that occurred to individuals when the social contexts satisfy their needs [17–19]. However, studies that link self-determination theory to teacher communities, have not highlighted the feature of *equality* in these universal needs and positive outcomes [20–23]. For example, in a recent case study conducted by Power and Goodnough [22], they described the effect of a large-scale five-year program for schoolteachers. Guided by self-determination theory, they designed learning activities and attracted teachers nationwide to apply for the learning opportunity. Each year, around 70–90 teachers were recruited, and six experienced permanent teachers who had been in this teacher community for around three years volunteered to be participants. However, their study violated what we know about *equality*. The participants were "elite" teachers who were competent enough to submit application forms and connected enough to apply for the program as a group. Additionally, the participants stayed in the program for the same three years as learners and their perceptions of the social context only told one side of the story. It is necessary to recruit teachers at different stages of the teaching career and with different community roles to equally present their experiences in need-satisfaction learning conditions.

2.3. Ego Depletion Theory

Contrary to self-determination theory that highlights the enhancement of people's energy [8,24], ego depletion theory is concerned about how people deplete their energy. Proposed by Baumeister et al. [9,10], ego depletion is defined as "a temporary reduction in the self's capacity or willingness to engage in volitional action (including controlling the environment, controlling the self, making choices, and initiating action) caused by prior exercise of volition" [25] (p. 1253). It is a psychological state which portrays how the self's execution of volition consumes limited inner resources (i.e., strength, power, energy, or vitality). It was claimed that since the active self is a limited resource, any acts of volition can deplete the internal resource and bring about detrimental consequences.

The theoretical notion of ego depletion concurs with a prevalent phenomenon of teacher burnout [26,27]. Suffering from chronic pressure at the workplace, teachers feel emotionally and physically exhausted, in other words experiencing a sense of energy depletion. The drained energy activates a vicious circle where teachers gradually lose interest in teaching and building relationships with students and colleagues. Therefore,

it can be assumed that teachers' psychological energy at the initial stage of community participation is low due to efforts exerted to be effective teachers at the workplace and to leave the workplace to learn. Baumeister et al. [25] concluded their study with the suggestion that social support has the potential advantage in helping people regain their energy. Teacher communities can serve as such a mechanism to support teachers with low energy. Ego depletion theory and self-determination theory are two guiding theories that the present study relied on to explain how depleted teachers become energetic members in the target B-PLN. Three research questions were specifically asked:

- RQ1: What are the themes and categories that emerge from English teachers' reflections upon years of experience in the B-PLN?
  - RQ1-1: Initially, why do English teachers enroll in this B-PLN?
  - RQ1-2: How do English teachers describe the target B-PLN?
  - RQ1-3: What do the learning experiences in the B-PLN mean to English teachers?
- RQ2: Can immediate feedback collected right after community learning activities confirm the resulting categories?

3. Materials and Methods

The following section describes who the participants were and how the data were collected and analyzed. Two sources of data were collected. One was comments reflecting on years-long experiences in the target B-PLN collected by interview questions while the other was immediate feedback on learning activities held by the target teacher community collected via *Words of the community*.

3.1. Participants

To represent a wide range of teaching experience and job positions in the target B-PLN, 21 English teachers teaching in senior high schools were purposefully selected. They were recruited in the following sequence:

1. Ten English teachers who started attending the B-PLN since it was established in 2014;
2. Six English teachers who regularly participated in learning activities hosted by B-PLN (average of their participation years = 2.67 years); and
3. Five more teachers mentioned by the above 16 teachers as "important members of the community".

Among the 21 participants, 19 were women (90.5%) and 16 were permanent teachers (76.19%). On average, they had been teaching for 10.74 years (range = 0.5~28 years) and their average years of community participation was 3.1 years (range = 1~4 years).

3.2. Data Collection and Analysis

Two sources of data were collected in the fall of 2018 with two distinct functions. *Semi-structured interviews* aimed to collect participants' overall reflections of their past learning experiences in the B-PLN while *Words of the community* intended to collect participants' immediate feedback upon their learning experiences in the B-PLN (collected right after they participated in the learning activities hosted by the B-PLN).

3.2.1. Semi-Structured Interviews and Content Analysis

Interview Questions

The semi-structured interviews [28] consisted of 13 questions (as shown in Appendix A). The first three questions were labelled *biographical information* to create the profiles of the participants, which were not used for analysis. The other ten questions addressed three topics: *initial experience, comparative reflection,* and *in-depth interpretation*. These topics were created through the lens of input-process-output (I-P-O) model [29], a common tool to evaluate the effectiveness of training. At this time point, we did not base our interview questions on any theoretical framework. The questions designed by the I-P-O model aimed to allow the participants to elaborate on their experiences of the on-the-job training in the

context of the B-PLN. It was at the data analysis stage that their responses were shaped by self-determination theory and ego-depletion theory.

Three questions under *initial experience* were expected to extract motivational conditions prior to community participation; another three questions under *comparative reflection* aimed to collect process experiences via comparison and contrast; and the last four questions under *in-depth interpretation* were used to inform the outcomes of attending the target community. These questions were not asked in a fixed order but proposed following the flow of the interviews. Some questions were asked before others but all were answered. When the interviewers found it necessary to clarify the given information, more WH-questions were asked subsequently.

Interview Process

The interviews lasted from one and a half to three hours depending on the number of interviewees. Ten participants were interviewed individually while 11 participants were interviewed as three groups (two groups with four participants each and one group with three participants). This uneven arrangement resulted from teachers' scheduling conflicts. Those who were available and did not mind being interviewed together constituted a group. They guaranteed they would not change or modify their responses even if other members were present. One researcher of the present study interviewed the participants while the other researcher took field notes and asked follow-up questions when it was necessary.

Transcription and Unit Number

The interview data were transcribed verbatim in Chinese and reread for several times before analysis. Since the dataset collected participants' ideas about their experiences in the B-PLN, "idea unit" was used as the unit of analysis. The chunked statements were given a list of symbols according to their locations in the dataset. The first symbol was participants' given identification, followed by the line number in the interview transcripts (e.g., T5_730). Statements were translated into English when cited in this study.

Content Analysis and Two Cycle Coding

The participants generated a total of 1663 statements but only meaningful 1224 statements (73.60%) were treated as data. Since the current study had a probative nature, content analysis with a two-cycle process [30] (p. 149) was carried out. The first cycle was exploratory, which allowed readers to "hear" from the participants via the descriptive coding method [31]. At the first stage, a code was proposed, debated, and decided by two coders. Since the experiences in the B-PLN should be shared by members, the threshold for a code to be created was that at least 40% of the participants explicitly expressed the same idea. The codes were then sorted according to the input-process-output perspective. At the second stage, the most common statements for each code were selected. Issues were discussed and debated until they were resolved. If one coder asked to revise or remove the initial codes, the two stages were repeated. Several iterations were inevitable to reach the final consensus. Because many codes were found involving complex interrelations, a second cycle of pattern coding [30] guided by self-determination theory [7,8] was executed to sort hierarchical configurations or meaningful explanations. At this stage, categories were formed by combining related descriptive codes generated at the first cycle. Following Saldaña [30], common themes were extracted from the categories. The lens of ego depletion theory [9,10] guided the formation of the themes. The analyses ended with a theory-driven assertion. Field notes written by the interviewers and content analyzers served as reference for data triangulation.

In addition to qualitative analysis, chi-square tests were also applied to examine whether frequencies of categories differed from each other. It was presumed that if the participants contributed more response statements coded as a certain category, they were more concerned about it and considered it more meaningful and valuable.

3.2.2. Words of the Community and Keyword Analysis

We proposed an innovative tool called *Words of the community* to serve as a validation of interview content analysis. Data collected by semi-structured interviews aimed to present the process from initial participation to current reflection of the participation experience. They were memory-driven and prone to memory bias [32]. In contrast, keywords participants proposed represented their immediate momentary experience. They were selective expressions for "instant experience" stored in the working memory, revealing the vividness of certain ideas. In fact, while interviews addressed participants' global memory of community perception, *Words of the community* filed their momentary experience activated by real-time instant participation. This tool was inspired by keyword query in data engineering where users locate needed information in a pool of complex datasets with correct keywords.

Procedure

Months after the interviews, the same participants assembled to attend an annual seminar event where they had face-to-face interactions with many other community members. Right after the seminar, they were invited to offer three keywords that best described the learning experience in the target B-PLN that they had experienced minutes ago.

Keyword Analysis

To analyze the keywords, we relied on the coding scheme developed from the interview protocols because of the inherent connection between the two datasets. Aware of the fact that the keywords were condensed notions about the target B-PLN, we skipped the first descriptive cycle and went directly to exert the second-cycle coding of categories. The keywords were translated into English when cited in this paper.

4. Results

4.1. What Are the Themes and Categories That Emerge from English Teachers' Reflections of Years of Experience in the B-PLN?

As can be seen in Figure 1, 24 codes (C1 to C24) were extracted via the first-cycle descriptive coding and organized according to the I-P-O model [29]. Table 1 presents the codes and their typical statements. The second cycle of pattern coding created 10 categories (see Figure 1). We clustered six *input* codes (C1 to C6) into *Need for autonomy* (Ca1 with two codes), *Need for competence* (Ca2 with two codes), and *Need for relatedness* (Ca3 with two codes). We classified seven *process* codes (C7 to C13) into *Supporting autonomy* (Ca4 with two codes), *Enhancing competence* (Ca5 with three codes), and *Increasing relatedness* (Ca6 with two codes). Finally, we grouped 11 *output* codes (C14 to C24) into *Altruism* (Ca7 with two codes), *Empowerment* (Ca8 with three codes), *Engagement* (Ca9 with two codes), and *Community-triggered emotions* (Ca10 with four codes; two for task-related feelings and two for social feelings).

Among the 10 categories were three common themes: *Energy depletion* (T1), *Energy refueling* (T2), and *Collective vitality* (T3). The inter-rater reliability of the themes was calculated separately (Kappa coefficients = 0.85, 0.86, and 0.78, respectively) [33]. Looking for the essence of the themes, we found that the reported community participation experience was ongoing and reciprocal. After English teachers attended community activities, they felt recharged and went back to schools. Then, they inevitably depleted their energy because of the workload and pressure. Aware of their low energy, they waited for the next opportunity to return to the B-PLN where they could receive and give out various cognitive and affective resources. To delineate this to-and-fro journey between the workplace and the B-PLN, we coined *Communal sustainability* and placed it on the top as the theory. Evidence that supports the extraction is presented below, according to the sequence of the research questions.

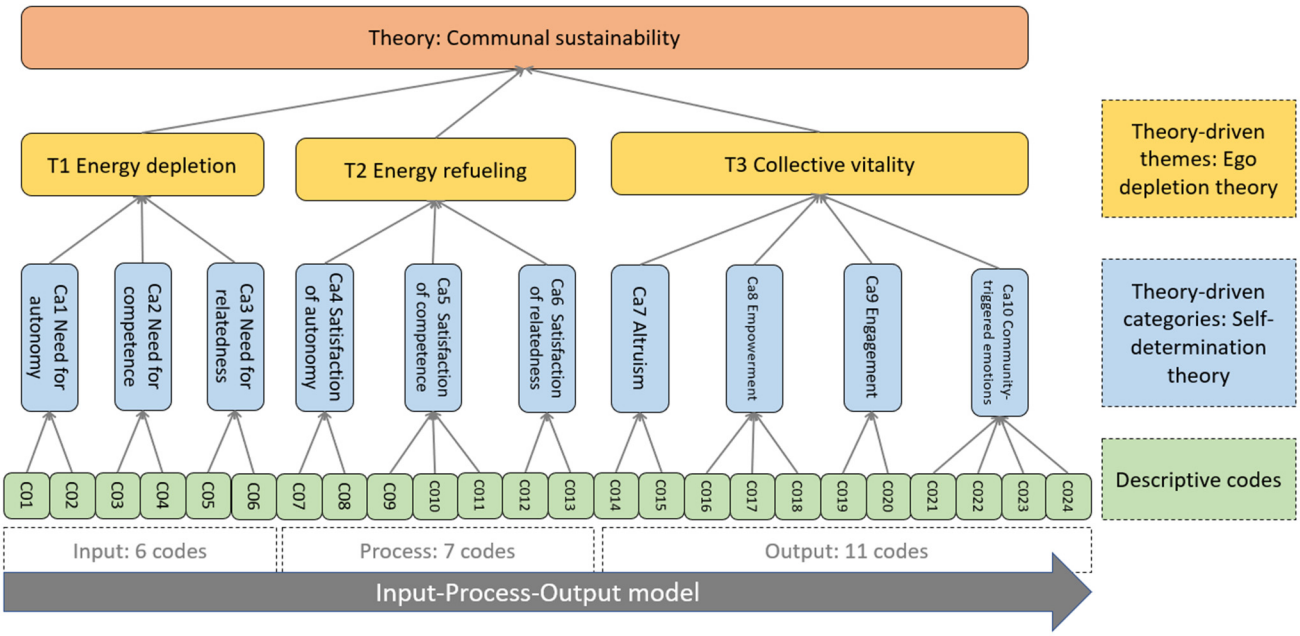

Figure 1. The process and results of two-cycle coding. *Notes*: The first-cycle coding generated 24 descriptive codes (C01 to C24) based on input-process-output model. The second-cycle explanatory coding extracted 10 categories (Ca1 to Ca10) based on self-determination theory, three themes (T1 to T3) based on ego depletion theory, and the final theory (*Communal sustainability*). The grey arrow below indicates the input-process-output model.

Table 1. Coding Scheme of the Interview Protocol: Codes and Example Statements in the First-Cycle Descriptive Coding.

Descriptive Codes of First-Cycle Coding	Typical Examples
C01 Forced to follow administrative directions	Everything here [the target B-PLN] is spontaneous. If you want to, you can try it. If you feel like responding to others, go ahead. If you don't do anything, it's still fine. This autonomy and flexibility are very important because we have been forced [by the administrative directions in my school] to do so many things at work. (T5_730)
C02 Forced to prioritize job requirements	I told Lisa [1] at that time that I'd love to join her and learn in the community [the target B-PLN], but I had so many classes to teach. Every Tuesday afternoon, when they had regular meetings, I had classes so I couldn't go with her. (T9_47)
C03 Aware of lacking professional knowledge	I felt empty . . . because I had nothing to say . . . about teaching. I felt like talking with a group of smart [colleagues] and I wasn't [smart]. (T10_106)
C04 Having the desire to make a change in teaching	I think we as teachers join the community [the target B-PLN] because we're looking forward to some changes in teaching. (T11_229)
C05 Having little connection with colleagues and feeling loneliness at work	Teachers seem to know many people but they are actually pretty lonely. When they are designing the course and teaching, they are all alone. The only source of feedback they get is from students, who are not mature enough to offer anything objective. (T15_1045)
C06 Having prior connection with someone in the community	I joined the community [the target B-PLN] because I knew Ashley. We were friends, so when she invited me, I said "Yes" without a second thought. (T2_1324)
C07 Allowed to participate in community activities in a free and flexible way	This community [the target B-PLN] is pretty open. Everyone can have a free discussion. If you like the idea, it's good. If you don't like it, it's fine . . . if you are not ready to share your ideas, it's still ok. Yeah, for me it's pretty free. (T9_1186)

Table 1. *Cont.*

Descriptive Codes of First-Cycle Coding		Typical Examples
C08	Embracing the diversity of individual difference	This community [the target B-PLN] welcomes all that are interested in EFL teaching. Anyone can become a community member, if they want to. They don't have to be full-time teachers. Student teachers or even those that are taking educational courses at college are welcomed to become part of it. (T16_1196)
C09	Reflecting upon the learning experience and broadening one's mindset	I found our discussion more and more sophisticated. We asked questions, like "Why didn't the high achievers benefit from the activity?" "Why do we design this activity?" Why this and why that. We question why we are doing what we are doing, which makes me think deeper about my teaching. (T19_127)
C10	Increasing professional knowledge and learning teaching techniques	In the workshop, we discussed many issues. Iris talked about [the activities she had designed on] bees. In the beginning, her students couldn't follow her, so she modified the instructions and activities. She shared with us the [reflective teaching] model, which was new to me. (T17_610)
C11	Improving and changing one's teaching practice	The most obvious evidence is found in my teaching. After I come here [the target B-PLN], I find my practice changing every year. In addition to designing worksheets that I am good at, I also learn to adopt collaborative teaching . . . and I make minor changes so as to meet my students' needs in different classes. Taking students' needs into consideration is what I've learned these years. (T14_884)
C12	Maintaining constant interaction with those in the community	We look professional in public. We share innovative ideas about teaching. But what they [people who are not in the target B-PLN] can't see and don't know is that we contact with each other in a constant, private way. (T3_417)
C13	Building intimate bond with community members	We are different . . . We are much closer. When we meet at the workshop whether it is held here [the target B-PLN] or somewhere else [other organizations], we see old friends. We are more like a big family. (T6_116)
C14	Relying on each other in a reciprocal way	I am not the only provider; I am not the only one making contribution. I initiate the discussion and then there will be more to make up the whole thing. (T11_307)
C15	Taking action so as to benefit others in the community	Many teachers at that time were applying for the certificate of TEPD [2], if I did the public teaching, they could observe my class and complete the documents. That's why I did it. (T1_144)
C16	Gaining energy and support from others' feedback	You're supported here [the target B-PLN]. Whatever difficulties you encounter, you can always find someone in the community [the target B-PLN] to help you. Then you feel like being able to carry on. (T16_625)
C17	Showing the power to influence English teachers who are either inside or outside the community	My public teaching seemed to have influenced other teachers . . . They found it possible to guide students to reveal their inner self. It seemed that I had created some ripples and successfully made some changes. (T7_413)
C18	Receiving recognition and appreciation	I share my stuff [lesson plans and worksheets], and they [members in the target B-PLN] appreciate and use them. They will later tell me how good my stuff is . . . (T21_487)
C19	Being the sheer participant without being assigned of jobs	If I know there is a workshop [held by the target B-PLN] and I can make it, I will go without doubts. (T19_625)
C20	Actively involved in designing, preparing for, and executing community activities	If you want to know more about this community [the target B-PLN] . . . you have to be there and do something. Standing aside is not enough. (T11_382)
C21	Experiencing positive task-related feelings (i.e., enjoyment, hope, pride, relief, and satisfaction)	I attended many workshops . . . and learned those great activities. When I went back [to my class], I tried to apply what I had learned . . . Looking back at experiences like that, I somehow feel happy and proud because at least I give it a try. (T5_567)
C22	Experiencing negative task-related feelings (i.e., anxiety and shame)	We were discussing who would be the next one to do public teaching. Most of them had done it, and I could feel the awkward silence. So I said, "I'll do it". You know sometimes pressure pushes you forward, which helps you progress. But honestly speaking I felt anxious and afraid of teaching in public. (T20_1386)

Table 1. *Cont.*

Descriptive Codes of First-Cycle Coding	Typical Examples
C23 Experiencing positive social feelings (i.e., gratitude, empathy, admiration, sympathy and love)	What they said and did gave me the feeling of love, and unconsciously I accumulated this warm feeling in my heart. I was aware that sometimes I couldn't help but give out love in various forms. You take love, so you want to give love. It's natural. (T6_71)
C24 Experiencing negative social feelings (i.e., sadness and disappointment)	If this [the target B-PLN] is terminated because of some reasons, I will feel very sad. (T16_49)

[1] All names mentioned are pseudonyms. [2] TEPD stands for Teacher Evaluation for Professional Development, an evaluation system for Taiwanese teachers.

4.1.1. RQ1-1: Initially, Why Do English Teachers Enroll in This B-PLN?

Descriptive statistics of 287 (23.47%) meaningful statements is summarized in Table 2. Extracted from code one to six (see Figure 1) were Ca1 to Ca3. Ca1 (*Need for competence*) comprised the major proportion (42.51%) of the statements, followed by Ca2 (*Need for relatedness*, 37.63%) and Ca3 (*Need for autonomy*, 19.86%). These needs are depleted energy of different types, so the proposed covering theme was *Energy depletion*. We conducted chi-square analyses and goodness-of-fit tests to determine whether sample data were consistent with a hypothesized distribution in which the percentages of three motivational categories are equal (Ca1:Ca2:Ca3 = 1:1:1; each category was expected be 33.33%). The result was a significant difference ($x^2_{(2)} = 24.47,\ \rho < 0.05$), implying that the participants did not put equal emphasis on the three needs when they globally recalled their initial experiences. Ca1 (*Need for autonomy*) was less valued by the participants. However, a closer look into the descriptive codes (C01 and C02) demonstrated significant act of autonomy. The participants were actually picky about their learning opportunities and they insisted on attending the community under the pressure of time and work. The underlying role of autonomy will be elaborated later at the process stage of community experience.

Table 2. Descriptive Results of *Initial Experience* from Interview Protocols (Total Statements = 1224; n = 21).

Theme/Categories/Codes	Sum statements (% of total statements [4])	n [5]	M statements [6]	% of statements within the theme/category [7]
T1 [1]: Energy depletion	**287 (23.47%)**	**21**	**13.67**	
Ca1 [2] Need for autonomy	*57 (4.66%)*	*16*	*3.56*	*19.86%*
C01 [3] Forced to follow regulations at workplace	19 (1.55%)	9	2.11	33.33%
C02 Forced to prioritize job requirements	38 (3.11%)	14	2.71	66.67%
Ca2 Need for competence	*122 (9.98%)*	*21*	*5.81*	*42.51%*
C03 Aware of lacking professional knowledge	67 (5.48%)	17	3.94	54.92%
C04 Desire to make a change in teaching	55 (4.50%)	18	3.06	45.08%
Ca3 Need for relatedness	*108 (8.83%)*	*21*	*5.14*	*37.63%*
C05 Little connection with colleagues	76 (6.21%)	17	4.47	70.37%
C06 Prior connection with members	32 (2.62%)	17	1.88	29.63%

[1] T1 = Theme 1; [2] Ca1~3 = Category 1~3; [3] C01~06 = Code 01~06. [4] % of total statements = (Sum of statement)/1224 (# Total statements). [5] n = n person giving the statements. [6] M statements = (Sum of statements)/(n person giving statements). [7] % of statements within the theme/category = (Sum of statement)/(#statements within the theme/category).

Need for Autonomy (Ca1)

As shown in Table 2, Ca1 contained 57 statements that were contributed by 16 participants and extracted from C01 (*forced to follow administrative directions*) and C02 (*forced to*

prioritize job requirements). C01 labeled statements in which the participants complained how they were forced to attend learning activities that claimed to benefit their professional development. C02 covered statements about how English teachers gave up learning opportunities because of heavy workload, tight schedules, etc. These two codes were grouped together because they highlighted the violation of teachers' volition which exemplifies a major conflict between the need of autonomy (a basic need in self-determination theory) and job responsibilities. However, these statements did not seem equally troublesome. The percentage of C02 was two times the number of C01 (66.67% against 33.33%).

Need for Competence (Ca2)

Converged by *aware of lacking professional knowledge* (C03) and *having the desire to make a change in teaching* (C04), 122 statements contributed by all the participants were related to the desire for better teaching experiences. C03 documented concerns about insufficient knowledge in dealing with challenges inside the classroom (students' amotivation, executing educational policies, designing theory-based courses, etc.) and catching up with educational trends outside the classroom (looking for and attending a teacher community, doing public teaching, cooperating with peer teachers, etc.). C04 captured teachers' boredom of repetitive teaching routines and curiosity about new possibilities feasible to their teaching. These two descriptive codes documented teachers' need for competence (another basic need in self-determination theory). C03 (54.92%) was ten percent more than C04 (45.08%) but more participants talked about C04.

Need for Relatedness (Ca3)

Contributed by all of the participants, Ca3 included 108 statements and was extracted from *having little connection with colleagues and feeling loneliness at work* (C05) and *having prior connection with someone in the community* (C06). C05 illustrated the push power at the workplace where the participants had little interaction with colleagues. They found it difficult to have professional dialogues at the workplace, so they came to the target community to look for partners or friends. C06 included statements describing the pull power of social connections existing before the participants became members of the community. C05 and C06 revealed teachers' need for relatedness (the third basic need in self-determination theory). This relational push–pull struggling was not a draw game because a noticeable difference was detected in the percentages (C05: 70.37% against C06: 29.63%; see Table 2).

4.1.2. RQ1-2: How Do English Teachers Describe the Target B-PLN?

A total of 401 meaningful statements (32.79%, see Table 3) from six descriptive codes were sorted into three categories: *Supporting autonomy* (Ca4, 23.69%), *Enhancing competence* (Ca5, 34.91%) and *Increasing relatedness* (Ca6, 41.40%). Again, we tested the frequencies via the chi-square goodness-of-fit test with the same hypothesis (Ca4: Ca5: Ca6 = 1:1:1; each category was be expected to be 33.33%). The result was a significant difference ($x^2_{(2)} = 19.31,\ \rho < 0.05$), implying that when the participants talked about this community as a learning environment, they put different emphasis on the categories. They elaborated on increased relatedness more than enhanced competence and supported autonomy. The three categories implied that English teachers' low energy at the initial stage of community participation was refilled at this stage, so we used *Energy refueling* as the covering theme.

Supporting Autonomy (Ca4)

Ca4, consisting of 95 statements from 18 participants (see Table 3), was extracted from two descriptive codes: *allowed to participate in community activities in a free and flexible way* (C07) and *embracing the diversity of individual difference* (C08). C07 was given to statements where the participants expressed that they were not demanded to participate in *every* community activity. Failing to be present did not bring them penalty. C08 described how differences that community members brought into the community were welcomed and appreciated. These two descriptive codes showed that the teachers' need for autonomy

(a basic need in self-determination theory) was supported in the target community where they could demonstrate their volition for professional development. The frequency of C07 (55.79%) was higher than C08 (44.21%), showing that the participants talked more about the freedom they enjoyed in the community than the differences they recognized among community members.

Table 3. Descriptive Results of *Process Experience* from Interview Protocols (Total Statements = 1224; n = 21).

Theme/Categories/Codes	Sum of statements (% of total statements [4])	n [5]	M statements [6]	% of statements within the theme/category [7]
T2 [1]: Energy refueling	**401 (32.79%)**	**21**	**19.20**	
Ca4 [2] Supporting autonomy	*95 (7.77%)*	*18*	*5.28*	*23.69%*
C07 [3] participating in free-flexible way	53 (4.33%)	16	3.31	55.79%
C08 embracing individual difference	42 (3.43%)	12	3.50	44.21%
Ca5 Enhancing competence	*140 (11.45%)*	*21*	*6.67*	*34.91%*
C09 reflecting experience & broadening mindset	49 (4.01%)	17	2.88	35.00%
C10 increasing knowledge/techniques	47 (3.84%)	15	3.13	33.57%
C11 improving teaching practice	44 (3.60%)	12	3.67	31.43%
Ca6 Increasing relatedness	*166 (13.57%)*	*21*	*7.90*	*41.40%*
C12 maintaining interaction	50 (4.09%)	17	2.94	30.12%
C13 building intimate bond	116 (9.48%)	19	6.11	69.88%

[1] T2 = Theme 2; [2] Ca4~6 = Category 4~6; [3] C07~13 = Code 07~13. [4] % of total statements = (Sum of statement)/1224 (# Total statements). [5] n = n person giving the statements. [6] M statements = (Sum of statements)/(n person giving statements). [7] % of statements within the theme/category = (Sum of statement)/(#statements within the theme/category).

Enhancing Competence (Ca5)

Composed of 140 meaningful statements, Ca5 was a pervasive topic among the 21 participants (see Table 3). Under this category were three descriptive codes: *reflecting upon the learning experience and broadening one's mindset* (C09), *increasing professional knowledge and learning teaching techniques* (C10), and *improving and changing one's teaching practice* (C11). C09 included statements where English teachers claimed they thought deeper about their teaching and student learning. C10 covered expressions that recorded illustrations of acquiring new pedagogical knowledge and teaching techniques. C11 described statements where teachers explained how they applied learned knowledge and techniques to change their teaching. These three descriptive codes showed that the teachers' need for competence (another basic need in self-determination theory) was enhanced in the target community where they could refine their knowledge and skills relevant to teaching. As shown in Table 3, English teachers reported almost equal amount of the three codes (35%, 33.57% and 31.43%), implying that they put almost equal emphasis on their progress in both cognitive functions (C09) and technical practices (C10 and C11).

However, some participants showed a decreasing interest in competence enhancement shown by statements such as, "I gradually found the [professional] stimuli . . . you know . . . weaker" (T17_256). This negative comment might be legitimate enough for this participant to drop out but they stayed and sustained the membership for many years. Clues to comprehend this paradox could be found in this quote, "We're professional, of course. But you can find plenty of opportunities to enhance your 'profession' outside this community. But here, you can have more interactions with others and build connections" (T13_427). This participant and many others pinpointed that what made this community unique was interpersonal connections.

Increasing Relatedness (Ca6)

The 21 participants contributed 166 meaningful statements that were categorized into Ca6 (see Table 3). Compared with the other categories (Ca4 and Ca5), Ca6 was found to draw the greatest attention. It was extracted from descriptive codes of *maintaining constant interaction with those in the community* (C12) and *building intimate bond with community members* (C13). C12 highlighted the quantity of time members spent together while C13 emphasized the quality of the relationship. C12 and C13 captured how teachers' need for relatedness (the third basic need in self-determination theory) was increased in the target community where they could build and maintain interpersonal relationships. In Table 3, a noticeable discrepancy was found in the frequencies of the two codes. The participants emphasized the depth of relationship (C13: 69.88%) over the frequency of interaction (C12: 30.12%). They seemed more interested in talking about the closeness of community members and put less emphasis on how constantly they interacted with one another. These English teachers came from 16 different schools, which means most of them were not colleagues whom they saw during the workday. Quality of the relationship appeared more meaningful for these English teachers who taught at different schools and even in different cities.

4.1.3. RQ1-3: What Do the Learning Experiences in the B-PLN Mean to English Teachers?

Table 4 presents the descriptive statistics of 535 meaningful statements. They constituted 11 descriptive codes (C14 to C24) and were sorted into four categories: *Altruism* (Ca7), *Empowerment* (Ca8), *Engagement* (Ca9), and *Community-triggered emotions* (Ca10). These four categories were considered indicators of well-functioning teachers in the target community from the perspective of self-determination theory. These codes could be further divided into outward behaviors and inward feelings. Ca7 and Ca9 documented observable behaviors of helping others and devoting time and energy to the community while Ca8 and Ca10 described the inner feelings evoked by the environment of the community. Since the codes revealed how English teachers gave out and took in energy exclusively in the context of the community, we used *Collective vitality* to serve as the theme of the outcomes.

As can be seen in Table 4, the most prominent category was Ca10 (36.07%) followed by Ca8 (25.42%), Ca7 (20%), and Ca9 (18.13%). The chi-square test was applied, and the hypothesized percentage for each category was equal (Ca7:Ca8:Ca9:Ca10 = 1:1:1:1; each category was expected to be 25%). The result showed a significant difference ($x^2_{(3)} = 41.73$, $\rho < 0.05$), suggesting that the participants placed different emphasis on the categories and that they elaborated on the interior power of Ca10 and Ca8 more than the exterior behaviors of Ca7 and Ca9.

Altruism (Ca7)

As Table 4 shows, Ca7 emerged from 107 meaningful statements contributed by 18 participants under two codes: *relying on each other in a reciprocal way* (C14) and *taking action so as to benefit others in the community* (C15). C14 documented statements where altruistic behaviors were triggered by recognizing the similarities between the self and others. English teachers demonstrated empathy toward those they helped and believed others would help them when they were in need. C15 codes "pure altruism" where helping hands were given for the sake of others without considering the self. Altruistic behavior, especially the selfless type, was found to be encouraged and prevalent in the vocation of teachers and generally the Chinese-speaking country [34]. This claim was supported by the finding that the percentage of C15 was almost three times higher than C14 (74.77% against 25.23%, see Table 4).

Table 4. Descriptive Results of *Reflective Comments* from Interview Protocols (Total Statements = 1224; n = 21).

Theme/Categories/Codes	Sum of statements (% of Total statements [4])	n [5]	M statements [6]	% of statements within the theme/category [7]
T3 [1]: Collective vitality	**535 (43.74%)**	**21**	**25.48**	
Ca7 [2] Altruism	*107 (8.75%)*	*18*	*5.94*	*20.00%*
C14 [3] relying on each other in a reciprocal way	27 (2.21%)	12	2.25	25.23%
C15 taking action to benefit others in the community	80 (6.54%)	18	4.44	74.77%
Ca8 Empowerment	*136 (11.12%)*	*19*	*7.16*	*25.42%*
C16 gaining energy/support from others' feedback	71 (5.81%)	19	3.74	52.21%
C17 showing power to influence English teachers in/out the community	37 (3.03%)	12	3.08	27.21%
C18 receiving recognition and appreciation	28 (2.29%)	11	2.55	20.59%
Ca9 Engagement	*97 (7.93%)*	*21*	*4.62*	*18.13%*
C19 being sheer participants without jobs assigned	37 (3.03%)	16	2.31	38.14%
C20 designing, preparing for, and executing activities	60 (4.91%)	19	3.16	61.86%
Ca10 Community-triggered emotions	*193 (15.78%)*	*20*	*9.75*	*36.07%*
C21 positive task-related feelings	70 (5.72%)	18	3.89	36.27%
C22 negative task-related feelings	8 (0.65%)	7	1.42	4.15%
C23 positive social feelings	97 (7.93%)	18	6.50	50.26%
C24 negative social feelings	18 (1.47%)	8	2.25	09.33%

[1] T3 = Theme 3; [2] Ca7~10 = Category 7~10; [3] C14~24 = Code 14~24. [4] % of total statements = (Sum of statement)/1224 (# Total statements). [5] n = n person giving the statements. [6] M statements = (Sum of statements)/(n person giving statements). [7] % of statements within the theme/category = (Sum of statement)/(#statements within the theme/category).

Empowerment (Ca8)

Under the 136 statements of Ca8 were three descriptive codes contributed by 19 participants (see Table 4): *gaining energy and support from others' feedback* (C16), *showing the power to influence teachers who are either inside or outside the community* (C17), and *receiving recognition and appreciation* (C18). C16 captured the receiving of positive influence from peer feedback. C17 included statements highlighting the influence the participants had on others. C18 described how the participants felt valued and cherished by community members. As Table 4 presents, there was a greater emphasis put on C16 (52.21%) followed by C17 (27.21%) and C18 (20.59%). Compared with the other categories (Ca7, Ca9, and Ca10), Ca8 ranked second (see Table 4).

Engagement (Ca9)

Ninety-seven statements spoken by 21 participants constituted Ca9 (see Table 4). This category emerged from two descriptive codes: *being the sheer participant without being assigned of jobs* (C19) and *actively involved in designing, preparing for, and executing community activities* (C20). C19 was assigned to expressions that describe peripheral engagement like joining learning activities as listeners and reading online as a lurker. C20 included descriptions of deeper involvement in the community on which English teachers actively spent time and energy. The participants described behaviors showing their active engagement more than peripheral engagement (61.86% against 38.14%, see Table 4). When compared with the other categories (Ca7, Ca8, and Ca10), Ca9 (18.13%, see Table 4) received less attention. This surprising result could be explained by this statement, "Being here is part of my life and our life. I am here and we are here. That's it" (T7_537). It had been internalized

as daily routine to be engaged in the community, so it seemed that the participants did not find it necessary to highlight the devoted time and energy.

Community-Triggered Emotions (Ca10)

Ca10, contributed by 193 statements from 20 participants, was extracted from *experiencing positive task-related feelings* (C21), *experiencing negative task-related feelings* (C22), *experiencing positive social feelings* (C23), and *experiencing negative social feelings* (C24). This community aroused both positive and negative emotions, but positive emotions (C21: 36.27% and C23: 50.26%, see Table 4) accounted for about 87% of the total statements.

What could not be ignored was the 13% of negative emotions (C22: 4.15% and C24: 9.33%). Negative task-related feelings (C22) referred to "anxiety," "fear," and "pressure" that the participants felt when they listened to outstanding speakers, learned new knowledge and skills, and were assigned missions. These negative learning-related feelings did not stop the participants from challenging themselves. Once they made it, they seemed to experience positive emotions. "I was afraid when I 'volunteered' to do public teaching. The results were satisfying anyway. I learned from others and they learned from me. I feel happy and relieved that I made the decision then" (T14_186). On the other hand, eight participants mentioned their worries about the termination of the community, indicating their emotional reliance on the community.

4.2. Can Immediate Feedback Collected Right after Community Learning Activities Confirm the Resulting Categories?

Table 5 presents the descriptive results and keyword examples of *Words of the community*. As the data reflected participants' immediate experience of the target B-PLN, categories that captured the process factors (Theme 2 *Energy refueling*, Ca4~Ca6) and output factors (Theme 3 *Collective vitality*, Ca7~Ca10) were used. As Table 5 shows, *Supporting autonomy* (Ca4) ranked first (44%), followed by *Enhancing competence* (32%) and *Increasing relatedness* (24%). This finding is different from the interview data where *Increasing relatedness* was more emphasized than *Enhancing competence* and *Supporting autonomy* (see Table 3). It seems that participants holistically valued warm interpersonal interactions, but when it came to immediate perception triggered by first-hand participation experience, they were more conscious of the atmosphere of "freedom" and "autonomy".

Table 5. Descriptive Results of *Words of the Community* (Total Keywords = 63; n = 21).

Themes/Categories	Sample keywords	Sum of keywords	% within categories	n person giving the keywords
T2 [1]: Energy refueling		**25**		
Ca4 [3] Supporting autonomy	Freedom; Autonomy	11	44.00	7
C05 Enhancing competence	Professional; Learning	8	32.00	7
Ca6 Increasing relatedness	Partners; Connection	6	24.00	5
T3 [2]: Collective vitality		**38**		
Ca7 Altruism	Sharing; Cooperative	4	10.53	4
Ca8 Empowerment	Empowered; Supportive	11	28.95	10
Ca9 Engagement	Devoted; Active	6	15.79	6
Ca10 Positive emotions	Happy; Warm	17	44.74	13

[1] T2 = Theme 2. [2] T3 = Theme 3. [3] Ca4~10 = Category 4~10.

Within the theme of *Collective vitality*, as shown in Table 5, negative task-related and social emotions were nowhere to be found. It was *Positive emotions* that dominated the keywords. More than half of the participants used keywords such as "happy" and "warm" to describe their immediate experience of the B-PLN. Its frequencies ranked first (44.74%), followed by *Empowerment* (28.95%), *Engagement* (15.79%), and *Altruism* (10.53%). This finding is consistent with what was found in the interview data (see Section 4.1.3).

5. Discussion

Based on the results of content analyses, this case study highlighted that the ups and downs of teachers' energy sustained the social environment of a blended professional learning network (B-PLN). This claim was supported by the detailed and thorough investigation of the reflective interview and immediate keyword datasets. Two significant findings are summarized as follows. First, theoretically grounded in self-determination theory [7,8] and ego depletion theory [9,10], we argued that social sustainability of a B-PLN is a joint force of individual energy refueling and collective vitality contributed by all the members. English teachers arrived at the community with low energy because they felt forced, incompetent, and isolated. The dissatisfaction of the needs generated the feeling of teacher burnout which negatively influenced teachers in various ways [26,27]. Their energy levels rose after their basic psychological needs were satisfied by the social capitals provided by the environment [7,8]. Collectively, they demonstrated communal vitality indicted by behaviors of altruism and engagement and by feelings of empowerment and community-triggered emotions. This finding provides empirical evidence for the notion that teacher communities are organisms that have "life".

So far, few studies have applied self-determination theory to investigate the motivation process in self-initiated teacher communities. Some studies relied on self-determination theory to develop intrinsic motivation questionnaires to measure teachers' willingness for career devotion and training participation [20,21], while others focused on how accomplished teachers taught and developed in contexts that were especially designed to meet criteria depicted in self-determination theory [22,23]. This study was the first to investigate teachers' voluntary actions in teacher-initiated B-PLN. This type of teacher community is becoming popular because the global educational systems are recovering from disruption caused by the COVID-19 pandemic. This recovery takes time, so the sustainability of a safe learning environment of equality [12–14] where teachers can access diverse resources and create innovative knowledge is significant and emergent [15]. This study is also among the few studies addressing the continuity of professional development in B-PLN with empirical evidence. In addition, the findings of the current study extend the teachers' job fulfillment model [35]. In the model, teachers at stage one perceive energy depletion and feel the impulse to make a change (*input* stage); at stage two and three, they propose and execute remedial strategies, such as what participants experienced at the *process* stage of energy refueling. One of the contributions of the present study was to complement the model by depicting the *output* stage where English teachers collectively created a social environment for professional development with vitality. Though the findings were extracted by the input-process-output model [29], teacher learning in this socially sustainable environment is not linear but circular, as has been implied in previous studies [20–23,36,37].

Second, teachers unevenly emphasized the topics at different stages. At the initial *Energy depletion (input)* stage, more of them enrolled as community members because they wanted to become effective teachers with competence. Faced with risks and uncertainties inside and outside the classroom, they were particularly aware of their insufficient professional knowledge. They relied on their inner resources to control and regulate themselves while struggling with students, parents, and responsibilities. This pursuit of effectiveness, not to mention the competitiveness among colleagues and schools, inevitably drained teachers' energy, so they reached out to social capitals promised by the community [11–13]. This community seemed to serve as an "harbor" for participants to moor and hitch, with abundant resources available for storage. It seemed that for these participants, before they became a part of the community, they were more interested in "cold" cognitive and technical changes. The volition to participate in the B-PLN was different from the volition that teachers exerted at work. The former was autonomous self-regulation of behaviors [7,8] which made it possible for teachers to regain their vitality from community activities that satisfied their basic needs. The latter, however, required teachers' ego strength to confront work difficulties and gradually drained their energy, bringing about feelings of loneliness and burnout [9,10]. This argument explains why the participants spared less time express-

ing their need for autonomy, because they were already a group of autonomous beings who did not have the emergent need for autonomy.

Following the findings at the *Energy depletion* stage where the autonomous decision to attend the B-PLN was mainly triggered by the desire to become effective foreign language teachers [38,39] with cold competence, we assumed that at the *process* stage, the participants would spend relatively more time elaborating on how community activities enhanced their abilities and skills. However, to our surprise, when they stayed in the community for a while, their attention was drawn from cold competence development to warm interpersonal relatedness. It was the satisfaction of relatedness that dominated the descriptions. They especially highlighted the quality more than the quantity of relationships. It seemed that community activities created a favorable condition to nourish interpersonal attachment and create psychological safety. The former refers to a sense of "camaraderie" [22] (p. 11) while the latter is defined as a shared belief that the environment is safe enough for risk taking [40]. Interpersonal attachment and psychological safety have been argued to create a sense of security and belongingness [7,8] and have been found relevant to collective learning, subjective vitality, positive emotions, and optimal functioning of communities and social sustainability [40,41]. This community as a harbor seemed to attract the drained teachers with a cold knowledge bank for their profession, but what hooked them appeared to be social resources for warm relationships. These positive influences of interpersonal relationships were supported at the *output* stage with the participants putting emphasis on describing altruistic behaviors, positive social emotions, and the feeling of empowerment. This global perception of the B-PLN was partially supported by the immediate experience of the community. Participants still put emphasis on positive social emotions (e.g., love) but they emphasized autonomy more than relatedness. This finding was reasonable when the features of the learning activity (i.e., seminar) was taken into consideration. Participants immediately reflected on their learning experience in the seminar activity, which was highly professional and teaching-relevant; they underscored what made this B-PLN different from other teacher communities that they knew or they were involved in. This autonomy-supported environment was the premise of well-functioning beings [7,8].

Collective vitality as the distinct feature at the *output* stage was a pooled product of the target B-PLN. We argued that while the majority of the previous studies highlighted traditional key performance indicators of community effectiveness (e.g., the completion of lesson plans and public teaching and the overnight progress of student performance) [4,16,42], they violated the components of *equality* and *safety* in the current understanding of social sustainability [11–13]. Stories of teachers' professional development should not exclude teachers that are not mature enough to generate performance of high quality and promote competition for awards and resources. It takes time for teachers to digest and internalize new knowledge and skills as well as experiment with teaching techniques, the same as any learners. Even if they fail to increase their effectiveness and competitiveness, their participation in teacher communities still counts because it refuels individual energy and helps create collective vitality, which sustains the life of the communities and hence breeds potential learning. Additionally, in previous studies [4,16,42], critical outcomes of teacher communities were often measured by teaching observation techniques or self-report teaching practice changes, which is incomplete because we are using individual outcomes to evaluate the community as a whole. Collective vitality and the sustainability of an influential professional development base (an energy storage for teachers to take and give social capitals) was proposed by the present study to serve as a prospective outcome variable to evaluate the quality and effectiveness of teacher communities.

The factor of *equality* in social sustainability [11–13] was highlighted in the present study by interviewing a variety of participants. There were novice and veteran teachers in terms of their teaching experience; pre-service and in-service teachers in terms of their positions; beginners, developers, and seniors in terms of their participation years; and initiators, helpers, and participants in terms of their community roles. As described in self-determination theory [7,8] and ego depletion theory [9,10], little difference was identified in

English teachers' initial and process experiences as well as reflective comments. However, we were aware that the participants seemed to have similar "psychological preference for ... how the world is viewed, how information is collected and interpreted, how decisions are made, and how individuals interact with the world" [43] (p. 433), as more than one participant used "comfort chamber" to describe the target B-PLN. Another way to understand this finding is inspired by the interview protocols where many participants mentioned that this community was not established to train elite teachers but to support general teachers to develop professionally throughout their career. Anyone who was interested in EFL teaching was given equal opportunities to learn, share, and be seen. The open and autonomous atmosphere and the emphasis on "inclusion" made this target B-PLN a unique and sustainable harbor for teachers to satisfy their needs and refuel their energy.

6. Conclusions

Supported by notions depicted in self-determination theory, ego depletion theory, and social sustainability, the major findings of the present study revealed that teachers initially joined the B-PLN with low energy, showing prominent need for competence. At the process stage, their energy rose with the need for relatedness noticeably satisfied. Finally, collective vitality of altruism, engagement, empowerment, and positive emotions uniquely emerged. These findings have the following implications. First, learning in a B-PLN, teachers can break teacher isolation and cooperate in the form of "symphonic harmony" that was described in Hadar and Brody's study [44]. The optimal transition from teacher isolation to collective vitality for professional development is neither a far-fetching utopia nor a legend told inside the ivory tower but a natural phenomenon happening in normal teachers' mundane lives. For community leaders and policy makers, they must attract members with learning activities that promise to satisfy their need for cold competence development. However, to keep members in the community, they must create a learning environment with warm relatedness so that members can actively engage and help others in the community with positive emotions instead of feeling stressed because of expectations to present certain work performance.

The second implication lies in our understanding of sustainability for B-PLNs. An equal learning opportunity should be given to those who feel the need to increase their competence. When they join with different types and levels of energy depletion, a safe learning environment should be provided to refuel their energy. This way, they can maintain the life of the community as engaged professionals and altruistic supporters. Finally, the innovative tool of *Words of the community* was found helpful to completement the self-report interviews. It provided researchers with another perspective to investigate community participation experience, and it complemented and validated findings collected via interviews.

The present study had several limitations that should be taken into consideration. First, since this is a case study of a distinctive EFL B-PLN, the results should be interpreted with caution when applied to other teacher networks nested under different systems of subject matter domains, schools and organizations, and cultures and policies, to name a few. Furthermore, the majority of the dataset was composed of interview protocols which share the same social desirability bias and other issues of reliability with all other self-report measurements.

Future studies can build on the results of current study by making use of the categories and themes to explain and investigate teachers' learning experiences in B-PLNs. Furthermore, they can develop questionnaires specifically for members in B-PLNs based on the typical statements presented in Table 1. Additionally, they can conduct follow-up studies that dig into interpersonal relationships and how they are sustained by common topics shared among community members.

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Appendix A. Interview Questions

Biographical information:

1. How long have you been teaching?
2. How long have you been joining this community? Do you play any roles in this community?
3. Except for this community, have you joined other professional communities?

Topic 1. Initial experience

4. How did you get to know this community?
5. What was your first experience with this community?
6. Why did you decide to become a member of this community?

Topic 2. Comparative reflection

7. Compared with your colleagues who are not in this community, how special are teachers in this community?
8. Compared with workshops that are not hosted by this community, how special are those that this community hosts?
9. Compared with other professional communities, how special is this community?

Topic 3. In-depth interpretation

10. How different do you find yourself become after you attend this community?
11. What do you teachers believe in as a community?
12. What is your vision for this community in the future?
13. What would you say to those who are curious about this community?

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