

Article

The Sustainable Development and Strategic Approaches for Contemporary Higher Education

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Abstract: Due to the increasing appearance of global contagious diseases such as COVID-19, the goal of this research is to directly and explicitly advance the learning motivation, interests, and performance of online course participants into developing sustainable development and strategic approaches to discover the effective solution of the research question: how to provide the most effective online courses of sustainable development strategy for contemporary higher education in order to advance the student's learning motivation, confidence, and desires? This is accomplished by integrating the three briefest analytical aspects of the Social Learning Theory, the main theoretical philosophies of Learning Community, and 10 core technological features to determine the most critical core determinants. Beyond the complex measured results, the most valuable conclusions were: (1) the highest Standardized Comparative Weight Scales (SCWS) was located in the Publicity Philosophy for contemporary online higher education sustainable development strategy, which meant the first hypothesis was accepted and the second and third hypotheses were denied. Hence, the Publicity Philosophy (PP) of the learning community directly and effectively advanced the contemporary online higher education sustainable development strategy for educational institutions as the best solution to the research question in order to achieve the main research objective. (2) Continuously, in detail, the PP of the learning community was directly and effectively enforced by the Professionalization Technology Feature of Course Function. This directly indicated that most online course participants focus on the professionalized technological features in the system operation, such as friendly operational platforms for easy uploads, convenient downloads of online course information, and real-time news during online courses at higher education institutions. Significantly, the aggregated technology in group discussions or teamwork assignments and the complete and fair evaluation of online course technological system can facilitate collaborative lesson preparation and lesson observation of the PP of the learning community in order to advance online course interests and learning performance to be the sustainable development strategic approach in contemporary higher education era.

Keywords: higher education sustainable development strategic approach; social learning theory (SLT); learning community (LC); factor analysis (FA); regression analysis (RA); analytical network process (ANP)



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1. Introduction

In the past, to recruit higher talent employees, many corporations have not only required college students to graduate from high-reputation universities, such as Harvard University, Massachusetts Institute of Technology, or the University of London, but also requested their transcript in order to further understand their studying situations. The mutual competition of the studying scale has been the most critical learning purpose. The learning is not for the learning knowledge; the correct answer is definitely for the learning knowledge. Significantly, the majority of parents deeply believe that the graduated diplomas and degree-certificates of high-reputation schools are directly able to allow each graduate to be recruited into the largest companies with higher salaries, but also a higher

social standing. Particularly, the majority of Asian students have desired to obtain the highest studying scales with a series of the highest and most serious of competitions. More Asian students have provided the over-qualified educational background to interview for positions at large international companies to gain the position over the bulk of other interviewees. Specifically, these huge international companies preferred to recruit these interviewees with the over-qualified educational backgrounds to ensure these recruited freshmen better contribute towards the job and their working performance. Ultimately, this vicious learning-scale-hiring circle has directly formed a mutual group of competitions. Critically, a great studying scale results in better job positions, which represents higher salaries and social levels. The student's learning, therefore, becomes one of utilitarianism. The most critical situation that has occurred thus far is that many students have not only abandoned their learning, but also further escaped from the educational institutions as there is too much mutual competition impacting their confidence, desires, and their motivation to learn. To combat the cutting off of this learning-scale-hiring circle and decrease pressure on students, more education institutions are implementing reform through the reduction of examination subjects, content, and transforming all examination questions to the multiple-choice format. Alternatively, this competition-scale-hiring circle is not effectively ended. Instead, this educational competition has gotten stranger. Approximately 35 years ago, Professor Manabu Sato of the University of Tokyo, innovatively mentioned the Learning Community ("LC") [1] in an attempt to break off this this completion-scale-hiring circle. Professor Sato indicated that the essence of learning was not to study in high-reputation schools to be accepted into famous international companies and earn more money; however, it was to strengthen self-knowledge and self-actualization to contribute to the development of society. Regarding LC, there are the three major theoretical philosophies [2]: (1) publicity philosophy, (2) democrat philosophy, and (3) eminent philosophy.

Furthermore, with the rise of wireless technologies and the resulting effect of the swift diffusion of information, many teachers, educators, and lecturers have begun to utilize these technologies to create a series of digital courses through wireless software and internet technologies, as well as computer hardware, communication, and consumer electronic (3C) devices. According to the most technological characteristics, everyone is not only freely and passively downloading and obtaining knowledge and news, but also directly and actively uploading and editing the information and knowledge from online websites and courses, such as Massive Open Online Courses ("MOOCs") [3–5], without traditional time and space restrictions. The innovative technological digital courses have forced the competing educational institutions to transform into three specific educational forms. These include: community education, where the learning responsibility is not only on the students but also the schools, teachers, parents, and other stakeholders; goaled education, where each education has a series of diversified learning applications, i.e., the mathematics class is not only for correct mathematics questions and answers, but it is for the learning of mathematic theory, models, calculation processes, etc.; correction education, where it should be to be altered to literacy education, since the corrected answer is not enough to cultivate a student's applied capacities and literacies in these complex learning circumstances. Therefore, the majority of people and students have the online and digital channels to obtain the professional knowledge without taking the traditional in-person classes in higher education institutions. Presently, there are some global contagious diseases that have appeared, such as the Severe Acute Respiratory Syndrome coronavirus (SARS) in 2002, the coronavirus pandemic in 2019 ("COVID-19"), etc. Significantly, COVID-19 has resulted in the infection of 252 million people and the death of 5.08 million people, according to the official daily updates report of the World Health Organization (WHO) at the time of publication of this research paper [4]. Due to this global mass of infectious diseases, the traditional face-to-face lecturing methods have been limited, and digital and online courses have replaced the traditional face-to-face lecturing methods through diversified 3C (computers, communications, and consumer) electronic products. Taking the global contagious diseases development into consideration, this serious circumstance

has compelled a majority of educational institutions to cease in-person teaching and to aggressively turn to online teaching to survive in the hyper-shock of the current global pandemic for their online course's sustainable development strategy [5]. Due to the rapid development of the wireless and telecommunication technologies, most people have been accustomed to obtaining knowledge and information from various forms of technology, such as their smartphone.

Taking the sustainability in education into consideration, the question "how can we provide the most effective online courses of a sustainable development strategy for contemporary higher education, in order to advance the student's learning motivation, confidence, and desires?" has played a critical mainstream concern in the related research fields [6–8]. A comprehensive review of relative studies [9–11] reveals that no published study has directly analyzed the online course learning community from an individual student, school organization, and learning community's social aspects (as shown in Figure 1) with consideration of technological features. In order to resupply this research gap, this research cross-employed the three brief analytical aspects of the Social Learning Theory ("SLT") [12], the Zone of Proximal Development ("ZPD") of Vygotsky educational scholar, and the main theoretical concepts of LC to analyze and identify these technological features in higher education online courses. This was completed in order to effectively advance the learning community to further drive or trigger the extensive online course participants' learning motivation, confidence, and desires with the aim of achieving the learning essence of each online course. Since the three briefest analytical aspects of SLT were directly analyzed, the relations among the main theoretical concepts of LC are shown in Figure 1.

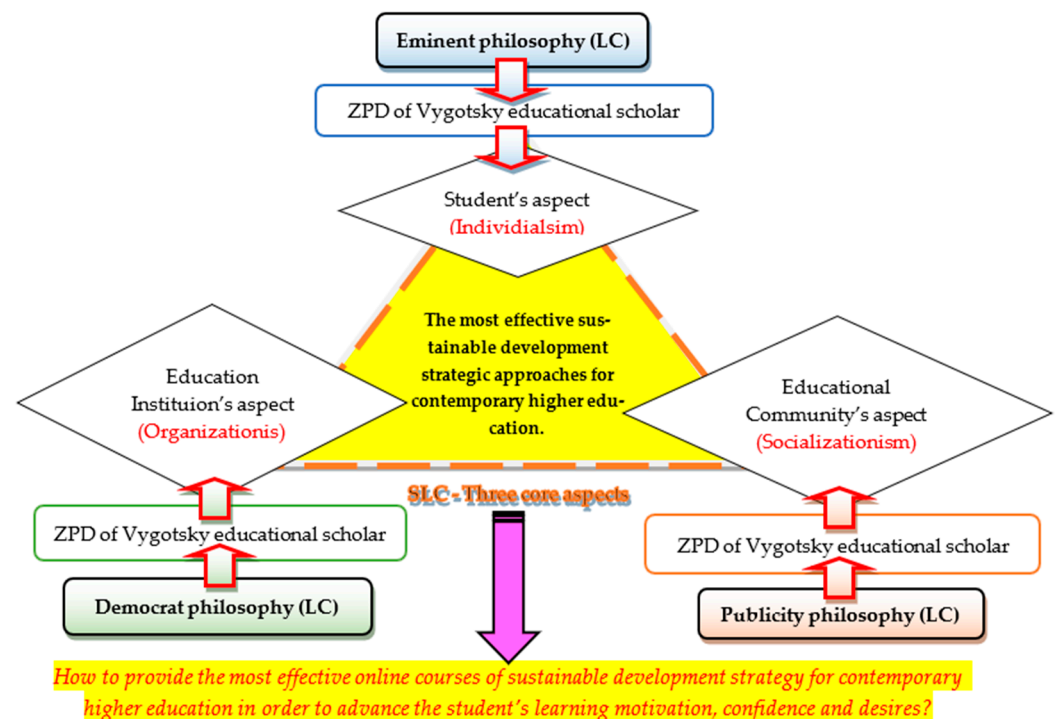


Figure 1. The main research framework.

As shown in Figure 1, the main objectives of this research was to induce the most effective learning community in contemporary online higher education sustainable development strategy in order to detect the best solutions for the research question: "how to provide the most effective online courses of sustainable development strategy for contemporary higher education in order to advance the student's learning motivation, confidence, and desires?" in consideration and association with the ZPD of Vygotsky educational scholar and main theoretical concepts of LC. There were three essential hypotheses:

First Hypothesis: the 10 core technological features in the higher education online courses directly influence the Publicity Philosophy for the most effective Contemporary Higher Education Sustainable Development Strategic Approach (“PPCHESDSA”).

Second Hypothesis: the 10 core technological features in the higher education online course directly influence the most effective Democrat Philosophy for Contemporary Higher Education Sustainable Development Strategic Approach (“DPCHESDSA”)?

Third Hypothesis: the 10 core technological features in the higher education online course directly influence the most effective Eminent Philosophy for Contemporary Higher Education Sustainable Development Strategic Approach (“EPCHESDSA”)?

In order to evaluate the interplays and interactive dependences of the three brief analytical aspects of the SLT in Figure 1 (in terms of the statistically analytical methods), this research cross-applied the Factor Analysis (“FA”) of quantitative analysis [13] and the Regression Analysis (“RA”) of qualitative analysis [14] to administer the results from a large-scale questionnaire. This refined the key factors of the 10 core technological features in the online course on the contemporary online higher education sustainable development strategy with the higher research representativeness, reliability, and faithfulness. The FA of quantitative analysis was created for refining the importance and identifying the interactive dependences of evaluated factors through the large-scale questionnaires. Furthermore, the RA of quantitative analysis was induced to verify the appropriateness of the FA of quantitative analysis. Eventually, this research specifically employed the Analytical Network Process (“ANP”) [15] of hierarchical qualitative analysis to construct the evaluated analytical hierarchy in order to not only hierarchically handle the results of the questionnaire from field experts, but to also systematically consolidate the measured results of the FA method of quantitative analysis and the RA of qualitative analysis with the higher research validity and professionalism [16].

2. Literature Reviews

2.1. Literature on Main Modern Concepts

According to Figure 1, the interactive relations between the three brief analytical aspects of SLT and main theoretical concepts of LC on contemporary online higher education and sustainable development strategy was designed and demonstrated in this section. In detail, the core theoretical philosophies of LC are comprised of (1) publicity philosophy, (2) democrat philosophy, and (3) eminent philosophy. Publicity philosophy signified that educational institutions such as universities, senior high schools, elementary schools, etc. were understood to be public spaces, which meant that these educational institutions must be accessible to all. Based on this publicity philosophy, Professor Sato considered that once in a year, each course of these educational institutions had to hold or implement at least one of the collaborative lesson preparations and lesson observations for the better interflow of each course. Democrat philosophy states that each principle, teacher, parent, student, and stakeholder is a master stakeholder in the educational institution. Each of these stakeholders have the right to make a statement or speech, as well as attend each association and activity related to the educational institution. Eminent philosophy denotes that each educational institution must fairly provide the prominent teaching resources, such as lecturing materials, teaching contents, etc. to each student without consideration of a student’s individual condition such as studying scale and social background (i.e., family wealth). These three core philosophies of LC were integrated into the interplay triangulated relations of the initial SLC concept on the contemporary online higher education sustainable development strategy.

In detail, ref. [17] induced the learning comprehensive affected relations among individuals, organizations, and society in the learning relative research fields. Originally, the individual learning concept was directly influenced to organization learning development; organization learning development was directly impacted by the entire learning tendency. Eventually, the entire learning tendency was directly affected by individual learning concepts. On the contrary, the entire social learning tendency was indirectly led to

organization learning development, which was indirectly activated by individual learning concept, which was then indirectly dominated by the entire society learning tendency. Therefore, the three briefest analytical aspects in the interplay triangulated relations of SLT were applied to advance the main theoretical concepts of LC in online courses to advance the student's learning motivation, confidence, and desires on contemporary online higher education and sustainable development strategies.

In terms of LC, beyond the rapid development of a higher enrollment rate in Japan, the cramming education and pursuing the performance scales have resulted in the majority of students losing their organizational belongings to registered schools and learning interests of lecturing contents [18]. Therefore, Professor Manabu Sato from the University of Tokyo, Japan, addressed the brief concept of "learning community" to reform the entire education circumstance as taking not only students but also learning place, school, parents, and teachers to be as one comprehensive learning community in order to effectively raise the students' learning performance and interests through studying interflows and experience exchanges. According to the creative concept of learning community, the one-way teacher's teaching, single student's long learning, and school's cramming education ossification have been improving through better innovative educational bootstraps, which not only guided the majority of classroom students towards a happy learning experience, but also cultivated the classroom students thinking capacities to ensure them satisfied with the entire learning process and not just the studying scales. There are three philosophical statements to be understood in the learning community: (1) publicity; in which Professor Sato deemed classrooms in schools as public properties, meaning each teacher, school director, or principal must host at least one teaching observation for the public. This is because each professional teaching setting or lecture must be displayed and discussed by the public [19]; (2) democracy: in which Professor Sato stated each teacher and lecturer had to respect each student, meaning the teachers or lecturers had to share their classroom power with students. This transferred the classroom spotlight from the original dynamic of teachers lecturing to one of innovation including the students learning [20]; and (3) transcendence: where all educational content and lecturing is provided for all students without discrimination of any kind, including gender, family property, social level, background evaluation, etc., which means each teacher must offer the best lecturing content possible [21]. Specifically, the lecturing materials and course structure are supposed to be designed as "moderate difficulty" for each student to efficiently raise the learning satisfaction of the most of students. Essentially, the reason for this is due to each educational institute wanting to achieve the goal of a symbiotic education, rather than a serious and competitive one. Although the cooperative learning is able to achieve the highest learning performance through team-cooperation, each team member still has to compete with each other to obtain the power as the leader in the team, which is very early in the learning variation. This is done by a reward and punishment system, whereby both systems allow for the student to learn from their success or failure, but also to allow the participating students to create a learning hierarchy based on the leader's decision or bootstrapping, which uses the team's common consensus to replace the learning equality and liberty spirit. It is an oversight that an over-emphasis on team cooperation to solve problems has transgressed the learning essence in educational subjects. The traditional education has always forced most students to pursue the studying scale without taking into consideration any kinds of enrollment processes; however, the learning community is here not only to inspire and cultivate each student, but also to provide a lecturer that can teach how to think, how to self-learn, self-regulation, and self-explore in contemporary unlimited and diversified knowledge fields. Materially, the learning community is able to directly improve the present popular cooperative learning since cooperative learning does focus on mission-oriented rewards and punishment systems to inspire the competitions between each team and indirectly restrain and strengthen leaning performance.

Hence, based on the ZPD of the Vygotsky educational scholar [22], ZPD was the difference between the student's actual development level of their learning performance and

the potential development level of learning performance according to the measured consequences. The actual development level of learning performance came from results from the student's own self-recognition learning. The potential development level of learning performance resulted in building a reflective community, jointing activity, developing higher mental function, and making sense of activities, since applying the relationship of learning and development was a dialectical unity through the learning leader's efforts. As a result, good learning leaders had to confirm each student's ZPD. The present popular cooperative learning needed a good leader or great guider to organize the common consensus of each team participant for piloting the entire team in order to achieve the missions with strong team cooperation. The learning community was supposed to make each learning activity into an interflow of ethical, cultural, and social practices, since each participated student can explore themselves in order to communicate with each other without hyper-competition relations. This self-exploration, self-dialogue, and interflow-coordination are definitely able to construct the professional knowledge, learning experience, and introspection-learning through a series of individual free will, thinking, and feeling since each participating student was directly and effectively established as a transcendent relation with the public's democrat learning practice in the learning community. Therefore, online courses are able to systematically design and create a series of subjects to supply a student's deficiency between his/her actual development level of learning performances and the potential development level of their learning performance, according to pre-course online tests and examinations through the learning community. As a result, the learning community continuously emphasized that each participating student was supposed to be self-learning and involved in mutual learning to make each participant, including school, teacher, parent, student, and learning stakeholder, obtain a series of different thinking, concept, perspective, knowledge, and experience from each different individual to confront the valuable problem, issue, and subject together. Through a succession of the reciprocal learning, interexchange listening, and interactive learning of the learning community, each participant of the learning community was able to recognize studying utility and mutual learning value, not only the cooperative relations or mutual use to achieve studying performance or problem-solving. For example, in the essence of calculated problems of the mathematic subject, the most learning students understand the mathematic concept, theory, development, and employment. This is not only in the correct answer, which means each learning community member was able to recognize the data-collection, data-explanation, thinking process of student's mathematic knowledge through student's learning procedures in order to continuously adjust mathematic lecturing materials, approaches and tendency. Eventually, the emphasis on subjective learning essence is the core of the learning community, which is the biggest difference between learning community and cooperative learning [23] on contemporary online higher education sustainable development strategy.

Eventually, in order to thoroughly discuss the research question, goals, and topics on contemporary online higher education and sustainable development strategies, the 10 core technological features in the online course, based on the authors' accumulated research results [24–26], were classified as the technological features evaluated criteria. Furthermore, these 10 core technological features in the online courses were the Aggregation Technology Feature of Course Function ("ATF-CF"), Evaluation Technology Feature of Course Function ("ETF-CF"), Professionalization Technology Feature of Course Function ("PTF-CF"), Convenience of Course Operation ("C-CO"), Course Complete Rate of Course Operation ("CCR-CO"), Openness of Course Operation ("O-CO"), User Completely Unrestricted Operation of Course Operation ("UCUO-CO"), Feedback Technology Feature of Interflow Function ("FTF-IF"), Re-purposing Technology Feature of Inflow Function ("RTF-IF"), and Connectionization of Inflow Function ("C-IF").

2.2. Assessed Statistic Methods

For comprehensive measurements of the highest research reliability, validity, and accuracy, this research consolidated the FA method of quantitative analysis and RA of

qualitative analysis to manage the 250 interviewee questionnaires, and then utilized the ANP of hierarchical analysis to process the expert and professional questionnaires for underscoring the research reliability and professionalism. Therefore, this session focuses on the FA method of quantitative analysis, RA of qualitative analysis, and ANP of hierarchical analysis. With reference to the highest research validity and representativeness in 250 interviewed questionnaires, the FA of quantitative analysis was employed in the first evaluated measurement since the FA of quantitative analysis was concluded to identify and classify the key determinants from a couple of related evaluated criteria or factors through a series of weighted compared computations. The brief computation of FA of quantitative analysis measured the evaluated relation weights between the dependent variables (direct observed influenced factors) defined as $Y(y_1, y_2, \dots, y_k)$ and independent variables (direct unobserved influenced factors) presented as $X(x_1, x_2, \dots, x_k)$. In sequences, Equation (1) [27] demonstrated to be relations between dependent variables $Y(y_1, y_2, \dots, y_k)$ and independent variables $X(x_1, x_2, \dots, x_k)$:

$$X(x_1, x_2, \dots, x_k) = \mu + \Lambda f(Y(y_1, y_2, \dots, y_k)) + \mu \quad (1)$$

s. t. 1: standardize intersection of variance is to be 1 (maximum).

where $X(x_1, x_2, \dots, x_k)$ was defined as a vector of observed responses, $f(Y(y_1, y_2, \dots, y_k))$ presented a vector of common factors, and μ was identified as a vector of unique factors defined on a population. The matrix Λ was a p by k matrix of factor loadings. It is assumed that the vectors $f(Y(y_1, y_2, \dots, y_k))$ and μ have mean zero and are uncorrelated, that the components of $f(Y(y_1, y_2, \dots, y_k))$ have variance one, and that the components of μ were uncorrelated. The vector of μ was the mean of $X(x_1, x_2, \dots, x_k)$.

If maximization:

$$X_k - u_k = \lambda_{k1}f_1 + \lambda_{k2}f_2 + \dots + \lambda_{km}f_m + e_k \left(\text{s.t. } (X - u)_{-k \times 1} = \Lambda_{m \times m} f_{m \times 1} + e_{-k \times 1} \right).$$

Variance–covariance matrix presents as:

$$\Sigma = \Lambda \Psi \Lambda^1 + \Psi_2 \Psi = \text{diag}(\Psi_1, \Psi_2, \dots, \Psi_k)$$

After executing the FA of quantitative analysis, the RA of qualitative analysis would be further employed to prove the measured results and appropriateness of the FA for constructing a higher research reliability and accuracy. In terms of developed history, the RA of qualitative analysis was created from the method of last squares for estimating an objects track in the solar system, especially for a comet's track. Ref. [28] was a scholar who utilized FA for detecting the relationship between parent's height and children's height in social science research. Therefore, FA of qualitative analysis is a kind of analysis data in statistics for understanding the correlations, dependence, and strength between two variables (the dependent variables, $Y(y_1, y_2, \dots, y_k)$ and independent variables, $X(x_1, x_2, \dots, x_k)$), or among multiple variables through a construct of series of mathematic models [29].

After implementing the FA of quantitative analysis and the RA of qualitative analysis, in order to identify, refine, and advance the research accuracy and professionalism of the entire cause and effect among each assessed criterion, ref. [30] employed the analytical hierarchy process ("AHP") for analyzing the one-way research subject and problem. As dealing with more complex subjects and problems, the one-way research method of AHP was completely challenged because AHP could not fully discuss the relations between each evaluated criterion. Therefore, [31] applied the results in the ANP appraised hierarchy to manage the relations between each evaluated criterion in estimated measurements through a series of pairwise-compared matrices between each evaluated criterion. The initial pairwise-compared matrices were expressed as follows:

$$A. = \begin{pmatrix} 1 - a_{1j} - a_{1n} \\ a_{i1} - a_{ij} - a_{in} \\ a_{nj} - a_{nj} - a_{1j} \end{pmatrix}_{n \times n} = \begin{pmatrix} W_1/W_1 - W_1/W_j - W_1/W_n \\ W_i/W_1 - W_1/W_1 - W_i/W_n \\ W_n/W_1 - W_n/W_1 - W_n/W_n \end{pmatrix}_{n \times n}$$

In this estimated pairwise-compare matrices, the measured weights were described as W_k and the pairwise-ratio displayed as W_i/W_j in the pairwise-compare matrices. Continuously, there were three kinds of characteristics in this pairwise-compare matrices as:

$$a_{ij} = W_i/W_j; a_{\max} = 1; \text{ for } I = j, a_{ij} \times a_{ji} = 1 \quad (2)$$

Significantly, the relative pairwise weights (W ($W = [W_1, \dots, W_j, \dots, W_n]$)) and the local priority vector w (eigenvector) of pairwise-compare matrices could be estimated by the vector quantities method ($AW = nW$) led from the inductive principle ($AW = \lambda_{\max}$). Furthermore, the priority vector and maximized eigenvalue were measured by the pairwise-compare matrices. As to testifying the consistency of an ANP hierarchical qualitative analysis, the two-stage algorithm was computed in Equation (3):

$$Rw = \lambda_{\max} w_i w_j = \sum_{j=1}^m (R_{ij} / \sum_{i=1}^m R_{ij}) / m \quad (3)$$

Continuously, the Consistency Index (C.I.) can estimate in each pairwise-compare matrices, and the Consistency Ratio (C.R.) can further estimate through the numbers of C.I. and Random Index (R.I.) computed from the estimated table of random index figure in Equation (4) [32]:

$$C.I. = (\lambda_{\max} - n) / (n - 1); C.R. = C.I. / R.I. \quad (4)$$

As the most critical flexibility of ANP hierarchical qualitative analysis, the numbers of the C.R. of each pairwise-compare matrix must be lower than 0.1, which indicates the higher evaluated consistency appearing in the evaluated measurements of each pairwise-compare matrix.

3. Research Design

Collected Questionnaires

With respect to the sample size of the collected questionnaires in the FA of quantitative analysis, [33] the first consideration was that the sample size had to be at least 100; however, [34,35] for higher research validity the ideal sample size should be between 100 to 300. Furthermore, [36] concluded that the sample size of the collected questionnaires was supposed to be more than five times greater than that of the evaluated factors in the FA of quantitative analysis for a higher research accuracy. Furthermore, [37] explored how the ideal sample size of collected questionnaires was 200 in the FA of quantitative analysis with a higher research exactness related to social science studies. For this reason, the original data size had to be designed for a total of 250 higher education online course participants in view of higher research validity and representation. The sampling technique used was the simple random sampling method [38] of probability sampling. Significantly, in terms of the research ethical regulations, the ethical review and approval of this research were waived with the exemption from trial in the social sciences. The main reasons were: (1) there was not any personally identifiable information from the interviewed participants to be released in this research; (2) all interviewees agreed with the usage-consent of their completed questionnaire information; (3) all interviewees must have been adults older than 18 years old (the adult age in Taiwanese laws); (4) there was not any intrusive surveyed measures during surveying. Therefore, a total of 250 participants were requested to participate in the survey, of which 237 agreed to complete the questionnaire. This represents a participation rate of 94.8%. A total of 91 questionnaires were completed by email. The remaining 146 questionnaires were completed in person by interview. In detail, the analytical findings are expressed in Table 1.

Table 1. The descriptive statistics of the FA method.

Gender	Male: 131 (55.27%)			Female: 106 (44.73%)	
Geography	Northern Taiwan ¹ : 75 (31.64%)	Middle Taiwan ² : 73 (30.8%)	Southern Taiwan ³ : 41 (17.29%)	Eastern Taiwan ⁴ : 9 (3.82%)	Foreign Countires ⁵ : 39 (16.45%)
How many hours have you spent on the internet	0–1: 52 (21.94%)	1–2: 82 (34.59%)	2–3: 71 (29.95%)	3–4: 27 (11.39%)	4 or more than 4 h: 5 (2.13%)
Did you learn with higher education online courses?	Yes: 199 (83.96%)			No: 38 (16.04%)	
Do you like to learn with online courses?	Yes: 203 (85.65%)			No: 34 (14.65%)	
Will you take higher education online courses in the future?	Yes: 178 (75.1%)			No: 59 (424.9%)	

¹: Chilung, Taipei, New Taipei, and Taoyuan cities. ²: Hsinchu, Miaoli, Taichung, and Changhua cities. ³: Yunlin, Chiayi, Tainan, and Kaohsiung cities. ⁴: Hualien and Taitung counties. ⁵: Foreign countries.

In association with the academic ethic regulations and policies of the Taiwanese Ministry of Science and Technology and Ministry of Education, the collected method was in-person questionnaire fulfillment without any invasive means. The interviewed higher education students were over the age of at least 18 years and all interviewees agreed with the use of the survey.

Professionally, as [39] indicated, the experts and professionals that collected the questionnaires consisted of at least over 10 percent of the entire surveyed data, with the least errors of higher research validity and reliability in the data collection through the Delphi method. The Delphi method was induced to obtain the objective information, comments, and standpoint in the data-collection processes through the multiple experts' independent and subjective identification and decision-making. Therefore, there were 15 experts and professionals that were designed to be interviewed in person for the expert's evaluated measurements in ANP hierarchical qualitative analysis. These 15 professionals were comprised of 5 researchers with over ten years research experience in online higher education and sustainable development in relative research fields, 5 scholars with over ten years of working experience in online courses of higher education and sustainable development, and the last 5 experts were the higher education professors with over ten years in research experience in the online education diversified research fields.

4. Research Measurements

FA Systematic Approach of Quantitative Analysis

With reference to the measured equation of the FA method of quantitative analysis, Table 2 expressed that the calculated numbers of the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.786, which was larger than 0.7, and the assessed numbers of significance of the Kaiser-Meyer-Olkin measure and Barlett test was 0.000 . . . , which was lower than 0.05. As a result, the FA method of quantitative analysis was definitely suitable for measuring these 137 valid questionnaires.

Table 2. The KMO and Bartlett's Test of the FA approach of quantitative analysis.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.786
Chi-squared test	483.378
Bartlett test of sphericity	df
	12
	Significance
	0.000...

Furthermore, Table 3 demonstrated the commonality of each evaluated criterion, sub-criterion, and candidate in the FA method of quantitative analysis. The commonalities of CF (Criterion) was 0.727, CO (Criterion) was 0.679, IF (Criterion) was 0.69, ATF-CF (Sub-criterion) was 0.775, PTF-CF (Sub-criterion) was 0.802, ETF-CF(Sub-criterion) was 0.771,

C-CO (Sub-criterion) was 0.674, CCR-CO (Sub-criterion) was 0.683, O-CO (Sub-criterion) was 0.649, UCUO-CO (Sub-criterion) was 0.675, FTF-IF (Sub-criterion) was 0.749, RTF-IF (Sub-criterion) was 0.695, C-IF (Sub-criterion) was 0.749, PP (Candidate) was 0.806, DP (Candidate) was 0.728, and EP (Candidate) was 0.684. In detail, based on the communalities of the FA method, there were very associated interplays and correlations between these 13 appraised criteria, sub-criteria, and candidates through measuring 137 valid extensive scale questionnaires.

Table 3. The communality KMO and Bartlett's Test of the FA approach of quantitative analysis.

Criteria, Sub-Criteria, and Candidates	Initial	Extraction
CF (Criterion)	1	0.727
CO (Criterion)	1	0.679
IF (Criterion)	1	0.69
ATF-CF (Sub-criterion)	1	0.775
PTF-CF (Sub-criterion)	1	0.802
ETF-CF(Sub-criterion)	1	0.771
C-CO (Sub-criterion)	1	0.674
CCR-CO (Sub-criterion)	1	0.683
O-CO (Sub-criterion)	1	0.649
UCUO-CO (Sub-criterion)	1	0.675
FTF-IF (Sub-criterion)	1	0.749
RTF-IF (Sub-criterion)	1	0.695
C-IF (Sub-criterion)	1	0.748
PP (Candidate)	1	0.806
DP (Candidate)	1	0.728
EP (Candidate)	1	0.684

After a succession of FA method computations, in terms of the re-search reliability and accuracy, the RA approach of qualitative analysis was further applied to these 107 extensive scale questionnaires to effectively discover the independencies and correlations among the entire appraised criteria, sub-criteria, and candidates. In Table 4, the R square of the first analytical model was 0.596, which meant 59.6% of the candidates of DP were affected by CF (Criterion), CO (Criterion), IF (Criterion), ATF-CF (Sub-criterion), PTF-CF (Sub-criterion), ETF-CF(Sub-criterion), C-CO (Sub-criterion), CCR-CO (Sub-criterion), O-CO (Sub-criterion), UCUO-CO (Sub-criterion), FTF-IF (Sub-criterion), RTF-IF (Sub-criterion), and C-IF (Sub-criterion). Subsequently, the R square of the second analytical model was 0.545, which meant 54.5% of the candidates of EP were impacted by the entire 13 criteria. Ultimately, the R third of third analytical model was 0.715, which meant that 71.55% of the candidates of RDC were affected by the entire 13 criteria. The evaluated explanation of the entire criteria of CF (Criterion), CO (Criterion), IF (Criterion), ATF-CF (Sub-criterion), PTF-CF (Sub-criterion), ETF-CF(Sub-criterion), C-CO (Sub-criterion), CCR-CO (Sub-criterion), O-CO (Sub-criterion), UCUO-CO (Sub-criterion), FTF-IF (Sub-criterion), RTF-IF (Sub-criterion), and C-IF (Sub-criterion) for the three candidates' criteria of DP, EP, and PP were higher than 50%.

Table 4. The R-test of the RA of qualitative analysis.

Analytical Model	R	R Square	Adjusted R Square	Estimated Standard Error
First	0.596 (a)	0.356	0.265	0.625
Second	0.545 (b)	0.297	0.199	0.65
Third	0.715 (c)	0.512	0.444	0.587

(a) Predictive Independent Variables: (constant), C-IF, CF, ETF, CF, CO, ATF-CF, O-CO, FTF-IF, UCUO-Co, C-CO, IF, CCR-CO, RTF-IF, PTF-CF; Depended variable: DP. (b) Predictive Independent Variables: (constant), C-IF, CF, ETF, CF, CO, ATF-CF, O-CO, FTF-IF, UCUO-Co, C-CO, IF, CCR-CO, RTF-IF, PTF-CF; Depended variable: EP. (c) Predictive Independent Variables: (constant), C-IF, CF, ETF, CF, CO, ATF-CF, O-CO, FTF-IF, UCUO-Co, C-CO, IF, CCR-CO, RTF-IF, PTF-CF; Depended variable: PP.

Subsequently, after a bulk of analyses of the variance (“ANOVA”) measurements in RA, Table 5 expresses the F value of the first model, which was 3.947, and the significance was 0.000, which was lower than 0.05. Hence, the RA model was able to be employed for not only estimating but also for indicating the correlation between the candidate of DP and the entire criteria of CF (Criterion), CO (Criterion), IF (Criterion), ATF-CF (Sub-criterion), PTF-CF (Sub-criterion), ETF-CF (Sub-criterion), C-CO (Sub-criterion), CCR-CO (Sub-criterion), O-CO (Sub-criterion), UCUO-CO (Sub-criterion), FTF-IF (Sub-criterion), RTF-IF (Sub-criterion), and C-IF (Sub-criterion). Continuously, after conducting the same ANOVA measurements in the second model of RA, the F-test value was 3.027 and the significance was 0.001, which was also lower than 0.05. Therefore, the RA of the second model was suitable to be utilized for estimating and detecting the dependencies and correlations between the candidate of EP and the 13 criteria. Subsequently, after implementing the same ANOVA measurements in the third model of RA, the F-test value was 3.503 and significance was 0.000 . . . lower than 0.05 as well. As a result, the RA of third model was able to be applied for estimating and indicating the dependencies and correlations between the candidate of PP and the 13 criteria. Eventually, after carrying on the first, second, and third model of RA analysis, the RA of qualitative analysis was prepared to be employed for estimating and discovering the dependencies and correlations between the candidate of DP, EP, and PP and the 13 criteria.

Table 5. The ANOVA test of the RA of qualitative analysis.

Model		Square Sum	Freedom Degree	Sum of Average Square	F-Test	Significance
First	Regression	20.018	13	1.54	3.947	0.000 . . . (a)
	Residual	36.281	96	0.93		
	Sum	56.299	106			
Second	Regression	16.133	13	1.241	3.027	0.001 (b)
	Residual	38.129	96	0.41		
	Sum	54.262	106			
Third	Regression	33.557	13	2.581	3.503	0.000 . . . (c)
	Residual	31.994	96	0.344		
	Sum	65.551	106			

(a) Predictive Independent Variables: (constant), C-IF, CF, ETF, CF, CO, ATF-CF, O-CO, FTF-IF, UCUO-Co, C-CO, IF, CCR-CO, RTF-IF, PTF-CF; Depended variable: DP. (b) Predictive Independent Variables: (constant), C-IF, CF, ETF, CF, CO, ATF-CF, O-CO, FTF-IF, UCUO-Co, C-CO, IF, CCR-CO, RTF-IF, PTF-CF; Depended variable: EP. (c) Predictive Independent Variables: (constant), C-IF, CF, ETF, CF, CO, ATF-CF, O-CO, FTF-IF, UCUO-Co, C-CO, IF, CCR-CO, RTF-IF, PTF-CF; Depended variable: PP.

Based on Figure 1, after a succession of the FA of quantitative analysis and RA of qualitative analysis, the ANP of hierarchical qualitative analysis was further applied in the questionnaire’s measurements from the 15 experts and professionals as illustrated in Figure 2.

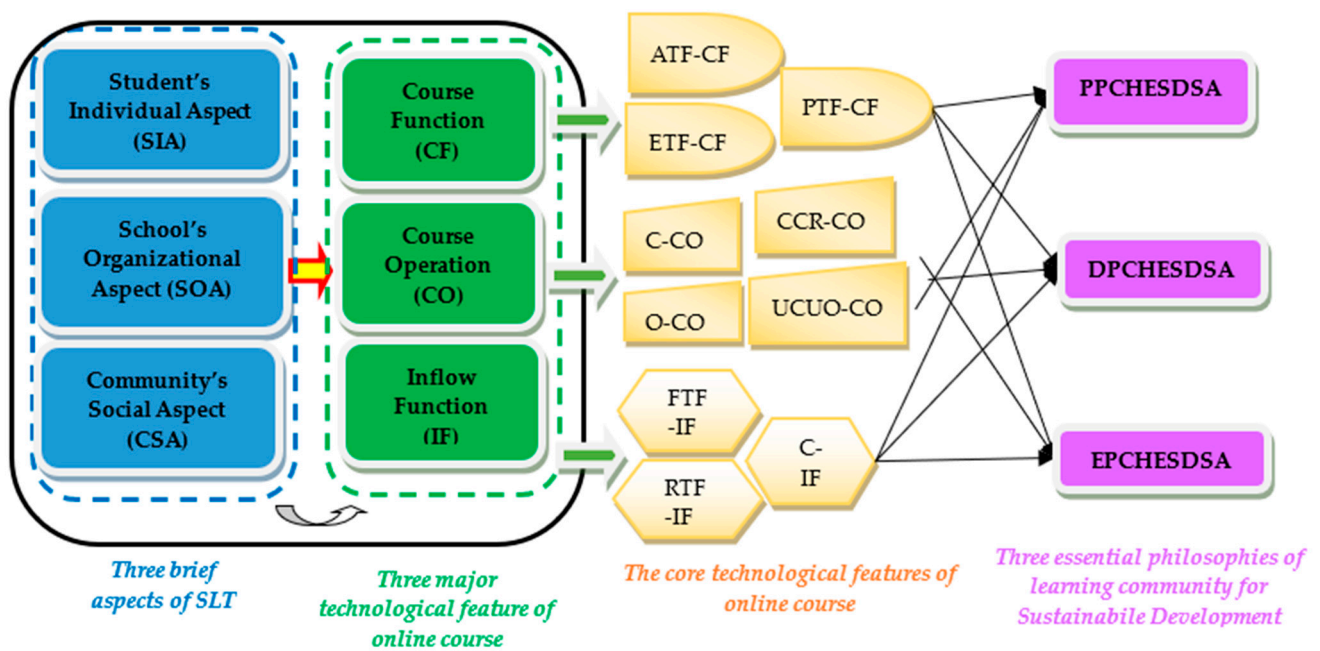


Figure 2. The ANP evaluated hierarchy.

With reference to the assessed measurements of Figure 2, the assessed pairwise-compared mix of the ANP hierarchical qualitative analysis among each appraised criterion, sub-criterion, and candidate were illustrated in Table 6. Briefly, all numbers of C.I. and C.R. of each pairwise-compared matrices were smaller than 0.1, which indicated the entire pairwise-compared matrix consisted of each appraised criterion, sub-criterion and candidate, and were higher interplays and correlations with each other in ANP hierarchical qualitative analysis.

Table 6. The entire commonalities of each assessed criterion, sub-criterion, and candidate.

Pairwise-Comparison Matrix	C.I.	C.R.
SIA	0.0368	0.0635
SOA	0.0327	0.0635
CSA	0.0523	0.0563
CF	0.0372	0.0902
CO	0.039	0.0673
IF	0.038	0.0655
ATF-CF	0.0341	0.0589
PTF-CF	0.0332	0.0572
ETF-CF	0.0287	0.0494
C-CO	0.0295	0.0509
CCR-CO	0.0212	0.0366
O-CO	0.023	0.0396
UCUO-CO	0.0303	0.0522
FTF-IF	0.0274	0.0473
RTF-IF	0.0259	0.0447
C-IF	0.0369	0.0637

In detail, Table 7 shows the assessed calculated consequences combined with the measured results of the FA method quantitative analysis into the ANP hierarchical qualitative analysis in order to achieve the higher research reliability, representation, validity, and truthfulness. Consequently and comprehensively, the highest of the SCWS was practically located in the PPCOHESDS (0.5819).

Table 7. The comprehensive evaluated measurements of the ANP hierarchical model.

Criteria	Communalities of FA Method	Weight-ANP	Sub-Criteria	Communalities of FA Method	PPCHESDSA		DPCHESDSA		EPCHESDSA	
					Weight	Evaluated Score	Weight	Evaluated Score	Weight	Evaluated Score
CF	0.727	0.5586	ATF-CF	0.775	0.5716	0.1799	0.2894	0.0911	0.139	0.0438
			PTF-CF	0.802	0.5887	0.1917	0.284	0.0925	0.1273	0.0415
			ETF-CF	0.771	0.5886	0.1843	0.2824	0.0884	0.129	0.0404
CO	0.6790	0.2857	C-CO	0.674	0.5912	0.0773	0.2733	0.0357	0.1354	0.0177
			CCR-CO	0.683	0.5928	0.0786	0.272	0.036	0.1352	0.0179
			O-CO	0.649	0.5713	0.0719	0.3043	0.0383	0.1244	0.0157
			UCUO-CO	0.675	0.5757	0.0754	0.2977	0.039	0.1266	0.0166
IF	0.6900	0.1557	FTF-IF	0.749	0.5768	0.0464	0.2944	0.0237	0.1289	0.0104
			RTF-IF	0.695	0.5689	0.0425	0.2937	0.0219	0.1374	0.0103
			C-IF	0.748	0.5788	0.0465	0.2998	0.0241	0.1214	0.0098
Standardized Comparative Weight Scales ("SCWS")						0.5819		0.2872		0.131

5. Conclusions and Recommendations

After a series of global contagious diseases and the rapid development of technologies in online courses at higher contemporary education institutions, technological online education scholars and researchers have devoted efforts to detect effective and efficient approaches to drive the student's learning motivation, interests, and performance. This research has cross-employed the three brief analytical aspects of the SLT and main theoretical concepts of LC to analyze and identify these technological features in higher education online courses to find out the most critical core determinants in order to directly and explicitly advance the learning motivation, interests, and performance of online course participants in higher education.

5.1. The Theoretical Contribution

After a series of complicated measurements in Table 7, there are the two academic contributive and empirical findings as listed below:

(1) The highest SCWS was located in the PPCOHESDSA (0.5819) which means the first hypothesis was accepted and that the second and third hypotheses were denied. Hence, the publicity philosophy of learning community was direct to be the most effective sustainable development strategic approaches for contemporary higher education in order to advance the student's learning motivation, confidence and desires in order to research question in order to achieve the main research objective.

(2) In detail, the publicity philosophy of learning community was directly and effectively enforced by the professionalization technology feature of course function (PTF-CF) (0.1917). This indicates that most of online course participants focus on the professionalized technological features in system operation such as friendly operation platform for easy uploads and convenient downloads of online course information and real-time news during online courses at higher education institutions.

5.2. The Managerial Implications

Significantly, in sight of the managerial implications of the conclusion, the aggregated technology in group discussion or teamwork assignments, as well as the complete and fair evaluation of online course technological systems can facilitate collaborative lesson preparation and lesson observation of public philosophy of learning communities in order to

advance online course interests and learning performances in higher education. Therefore, higher education management must institute the educational mechanism and policies to establish the aggregated technology in group discussions or team assignments, as well as complete a fair evaluation of technological online course systems to be the most effective contemporary higher education and sustainable development strategic approach. Materially, in consideration with the theoretical contributions, this research was cross employed by the three brief analytical aspects of the SLT, the ZPD of Vygotsky educational scholar, and main theoretical concepts of LC to analyze and identify these technological features in higher education online courses. This was completed in order to effectively advance the learning community for further driving or triggering of the extensive online course participants learning motivation, confidence, and desires with the ultimate aim of achieving the learning essence of each online course. The statistical methods were employed to analyze and to identify these technological features in higher education online courses with a series of evaluated measurements of statistical methods, including FA of quantitative, RA of qualitative, and ANP of hierarchical qualitative analyses in order to overcome the obstacle of contemporary online higher education and sustainable development strategies. However, there were still some study limitations in this research, due to the restricted research time and resources.

5.3. Concluded Discussion

Significantly, this research was creative as the first time to directly analyze the online course learning community from an individual student, school organization, and learning community's social aspects. It did so in association with the technological features through employing the consolidation with the three brief analytical aspects of SLT, the ZPD of Vygotsky educational scholar, and main theoretical concepts of LC to analyze and identify these technological features in higher education online courses in order to resupply a series of research gaps in the sustainable development of higher education development. Through a series of empirical measurements of quantitative and qualitative analyses, the conclusion was suggested that the public philosophy of the learning community was likely to be the most effective sustainable development strategic approaches for contemporary higher education in order to advance the student's learning motivation, confidence, and desires to research questions to achieve the main research objectives.

5.4. Future Direction

Hence, two theoretical and empirical suggestions for future direction are expressed as follows:

(1) Evaluated methodology: there are still some effective educational theories, such as the educational technology and learning theory, as well as efficient evaluated methods, such as the technique for order preference by similarity to ideal solution (TOPSIS), to be able to further improve the research analytical results with more research time and resources, which would induce more advantageous and extraordinary contributions and findings. With respect to research limitations, the number of research participants could be increased based on more research resources, support, and time.

(2) Appraised criteria: in statistics, there were still more evaluated criteria, such as learning behaviors and response from higher education online course participants and diversified online technological applications in course's construction that need to expand the future direction for re-classifying the higher education sustainable development strategic approaches.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

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Abbreviations

LC	Learning Community
3C	Computer, Communication, and Consumer Electronic
MOOCs	Massive Open Online Courses
COVID-19	Coronavirus disease 2019
SLT	Social Learning Theory
FA	Factor Analysis
RA	Regression Analysis
ANOVA	Analysis of Variance
AHP	Analytical Hierarchy Process
ANP	Analytical Network Process
ATF-CF	Aggregation Technology Feature of Course Function
ETF-CF	Evaluation Technology Feature of Course Function
PTF-CF	Professionalization Technology Feature of Course Function
C-CO	Convenience of Course Operation
CCR-CO	Course Complete Rate of Course Operation
O-CO	Openness of Course Operation
UCUO-CO	User Completely Unrestricted Operation of Course Operation
FTF-IF	Feedback Technology Feature of Interflow Function
RTF-IF	Repurposing Technology Feature of Inflow Function
C-IF	Connectionization of Inflow Function
PPCOHESDS	Publicity Philosophy for Contemporary Online Higher Education Sustainable Development Strategy
DPCOHESDS	Democrat Philosophy for Contemporary Online Higher Education Sustainable Development Strategy
EPCOHESDS	Eminent Philosophy for Contemporary Online Higher Education Sustainable Development Strategy
SCWS	Standardized Comparative Weight Scales

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