Research Article

Cultivation of College English Network Autonomous Learning Ability Based on the Multisource Information Fusion Algorithm

Wenjun Liu [ORCID]

School of Foreign Languages, Linyi University, Linyi 276005, Shandong, China

Correspondence should be addressed to Wenjun Liu; liuwenjun@lyu.edu.cn

With the rapid development of science and technology, the new century has entered an era of ever-changing information. Lifelong learning and lifelong education have become the dominance of a new round of educational concepts. Therefore, it is urgent to cultivate learners' autonomous learning ability. Self-directed learning has been a major focus of foreign language education in recent years. This research mainly explores the cultivation of college English online autonomous learning ability based on the multisource information fusion algorithm. This research will use a multisource information fusion algorithm to collect factors such as motivation, learning time, and other factors of students' English learning from multiple dimensions and then evaluate the college English online self-learning ability. The questionnaire on the self-learning ability of college students in the network environment includes five dimensions: understanding of teachers' teaching objectives and requirements, formulation and planning of learning objectives, effective use of learning strategies, monitoring of the use of learning strategies, and monitoring and evaluation of the learning process. The results of the study found that the highest score of the control class was 96 and the highest score of the experimental class was 86. The average score of the control class was 73.6 and the average score of the experimental class was 78.4, indicating that the average score of the experimental class was 4.8 points higher than that of the control class, and the standard deviations of the two classes were, respectively, 8.05 and 6.51. High-level students are better at using the network for effective learning than low-level students. High-level students are better at choosing learning strategies that suit them than lower level students. The value of sig (2-tailed) in the *t*-test is 0.004, which is less than 0.05. Therefore, we conclude that there is a significant difference in the posttest results of the two classes, showing a significant difference. This research will help to promote the cultivation of college English online self-learning ability.

1. Introduction

With the development of science and technology, the Internet and multimedia are widely used in English teaching. However, due to the lack of English learning strategy training in the network environment, learners encounter many difficulties in the process of autonomous learning. The gradual transition of the teaching mode of foreign language teaching to student-centered, information technology, and network-assisted autonomous learning. How to improve students' autonomous learning ability has also become one of the goals of college English teaching. This study believes that it is particularly important to learn to use learning strategies and conduct effective autonomous learning to improve English proficiency. At present, there are few empirical studies on autonomous learning strategies in the online environment, and most of the studies still use the Oxford language learning strategy scale, which cannot be directly applied to the context of online autonomous learning. Oxford describes learning strategies as indirect strategies and direct strategies according to the relationship between learning strategies and language materials.

The purpose of this research is to explore the current situation of English autonomous learning of this group, and to provide scientific feedback and suggestions for improving college students' English autonomous learning ability. For example, through the online teaching and management system, the learning situation of college students in online courses, the learning methods and study habits of college students can be understood [1–3]. And it can communicate

and guide with college students in real time through the intelligent software. Through the homework submission system, in addition to seeing the works of college students, the information such as the time when college students submit homework can be seen, so as to further tap the potential personality characteristics of college students. Therefore, the multisource of undergraduate information needs to consider the effective acquisition of information from multiple sources, the fusion of multisource information, and the provision of more accurate and comprehensive information for evaluation, so as to improve the effectiveness of evaluation and provide support for scientific decision-making.

This research attaches great importance to the individuality of college students, the student-centered education and management concept is embodied, the multisource information fusion theory is introduced into the research on the comprehensive quality evaluation of college students, and a three-dimensional comprehensive quality evaluation framework structure of college students with model dimensions, application dimensions, and implementation dimensions is established, which provides ideas for the establishment of the comprehensive quality evaluation system of college students. During the survey, it is found that only 2.1% of the students who studied English after school for 5-6 hours per day accounted for 8.6% of the total students who can study for 3-4 hours. Most of the students who study 1-2 hours per day accounted for 27.1% of the total, and the most is 62.2% of the students who only spend less than or equal to one hour for extracurricular English learning.

2. Relevant Work

In the process of autonomous learning, the lack of guidance and supervision of learning strategies makes students unable to use learning strategies effectively. As more and more countries take cultivating students' autonomous learning ability as one of the important goals of language teaching, the autonomy of language learning has become a hot spot in the field of foreign language education. Hester and Stone believed that reinforcement learning (RL) agents were often used to learn specific concrete tasks based on a predefined reward function. However, in some cases, the agent might be able to gain experience in the field before being assigned the task. Texplore-vanir is an RL algorithm based on an intrinsic motivation model. The algorithm uses a random forest to learn a transformational dynamic model of the domain [4]. Azwar believed that the research focuses were as follows: (1) to develop contextual teaching based on the Asian-Pacific cultural context (CTL-BKBA), which could effectively improve students' mathematical expression ability; (2) described the use of CTL-BKBA to develop and improve students' mathematical expression ability. The research and development of the 4D model was carried out in two stages: the development of the learning device and the testing device [5]. The objective of the Faez and Karas study was to test an online learner engagement model that combined social support (from teachers, peers, and family members) and a sense of community as direct and indirect factors, with academic self-efficacy acting as a mediator [6]. Keister et al. believed that to accurately determine an individual's competence in any clinical capacity, an individual must be able to self-assess the performance and identify individual limitations. Existing research showed that physicians at all levels were unreliable self-evaluators. This had raised concerns in medical practice, which requires constant updating of clinical capabilities and awareness of individual limitations [7]. Wain thought that reflection was the process of learning through everyday experience and an integral part of undergraduate and postgraduate higher education midwifery programs. Students were encouraged to use a structured reflection model to demonstrate their ability to reflect on their own experiences in clinical practice [8]. Their research on the training program of autonomous learning ability is relatively one-sided. In order to improve the autonomous learning ability, the previous materials are referred and the multisource information fusion algorithm is used and optimized.

The multisource information fusion algorithm shows a very good ability in multidimensional data acquisition [9]. Huang et al. believed that the existing unmanned aerial vehicle (UAV) mostly used a single sensor to measure the flight height, but this method was not accurate enough and was prone to interference [10]. Hu et al. proposed an asynchronous RUL fusion estimation algorithm for the hidden degradation process of multiple asynchronous monitoring sensors based on multisource information fusion. First, the statistical characteristics and correlations involving noise were analyzed. Second, an estimate of the hidden degradation state was obtained by applying a Kalman filter with correlated noise to the established state-space model, where synchronous observations were fused [11]. Kunst et al. believed that mental health care was an increasingly important component of acute patient care. But mental health nursing education could be limited in undergraduate nursing programs [12]. Harahap and Hasratuddin aimed to produce device-based learning methods. The method was realistic mathematics, practical, and effective, and all research tools were related to the application of these devices in mathematics learning [13]. Milovanova et al. analyzed the innovative component of the educational process in terms of a significant increase in the amount of mandatory independent work at universities [14]. Research studies on language learning autonomy emerge in an endless stream, which involve a variety of topics and research methods. Their research on the multisource information fusion algorithm is still relatively lacking in logic, and the multisource information fusion algorithm will be discussed later.

3. Cultivation Method of College English Online Autonomous Learning Ability

3.1. Ability Cultivation of Autonomous Learning. The concept of autonomous learning has always been an important subject of research in the field of educational psychology. Scholars have defined autonomous learning from different perspectives. The composition of autonomous learning

ability should include several aspects: metacognitive ability, such as planning, organizing, and arranging learning content; self-evaluation, self-monitoring, and self-direction ability; ability to effectively use resources; and motivation, attitude, self-efficacy, and rational use of abilities in the learning process. Autonomous learning should also include three specific processes of self-assessment, self-judgment, and self-reaction.

By observing the definition of autonomous learning of scholars, the researchers believe that autonomous learning actually means that learners can independently determine their own learning goals, choose appropriate learning methods, choose appropriate learning strategies in the learning process, monitor their own learning, and be able to properly evaluate the results of one's own learning. Self-learning people should actively manage their own learning behavior, design and implement their own learning plans, and be responsible for their own learning.

3.2. Multisource Information Fusion Algorithm.

Multisource information fusion, as a new multidisciplinary research field, is a data fusion method to meet the multisource correlation requirements of C3I military systems. Multisource data fusion technology refers to the use of relevant means to synthesize all information obtained through investigation and analysis, and to conduct a unified evaluation of the information, and finally obtain a unified information technology. The process of multisource information fusion is consistent with the process of human and animal cognition of things. Humans and animals use various sensory organs in the body to obtain information from various dimensions [15, 16]. After that, the brain combines these perceptual information according to certain principles to obtain the cognitive results of things. The process of multisource information fusion is similar to the abovementioned cognitive process of humans and animals. Scholars hope to use modern smart devices to simulate this fusion process and obtain fusion results. Different scholars have different views on the essential concept of multisource information fusion. Fusion is just a formal framework. The process of fusion is to use mathematical methods and technical tools to synthesize multisource data information, and finally obtain the valuable information we need. Information fusion makes full use of information from different sources, the redundant or complementary information from multiple sources are combined according to a certain standard, which plays the role of information enhancement and optimization. So more comprehensive and accurate fusion results can be obtained than single input information. At the same time, a consistent interpretation or description of the measured object can be obtained. In addition, the advanced parallel algorithm used in multisource information fusion greatly improves the speed of data processing and saves the time of data running. It also can suppress various noises to ensure the stability of the operating system. The focus of information fusion research is to propose some principles and methods so that the characteristics of multisource information patterns can

be distinguished. Then, it fuses highly correlated multisource information for comprehensive judgment. The application field of information fusion is not only limited to military applications but also widely used in biological information science, modern manufacturing, intelligent transportation, natural disasters, and so on. Multisource information fusion has already penetrated into many disciplines, which provides new research ideas for scholars in various disciplines [17].

3.3. The Process Design of Students' Autonomous Learning Based on the Network Environment.

In traditional classroom teaching, learning activities mainly rely on teachers' explanations. Teachers are at the center of the entire learning process. In the process of learning, students passively accept knowledge, and their learning behavior is often a process of mechanical memory that relies too much on teachers. Learning activities are mainly reflected in the flow of "textbooks-teachers-learners themselves." The assessment of learning ability is often based on test scores, and it is difficult to pay attention to the growth of students themselves.

However, web-based autonomous learning is quite different from traditional learning. The main body of learning activities has shifted from teachers to students, and students have become the masters of learning. Students need to customize their own learning goals, formulate their own learning plans, adjust their learning progress, monitor their learning progress, and evaluate their learning results according to their own abilities.

The process of student self-learning is shown in Figure 1. The essence of autonomous learning activities is a learning process in which autonomous learners continue to enrich, expand, deepen, and increase their prior knowledge and experience.

(1) Determine what is in line with learning goals.

In the initial stage of autonomous learning, students need to use the Internet to convert the teacher's overall teaching goals into their own learning goals.

(2) Develop a study plan that suits for learners.

Self-directed learners should arrange their own learning plans reasonably according to the teacher's teaching progress and combined with their existing knowledge level.

(3) Choose the content that suits for learners.

According to the relevant learning resources on the network platform and some relevant materials provided by teachers, self-directed learners should determine the content of independent learning.

(4) Accumulate and enrich learning outcomes.

Self-directed learners actively construct the existing knowledge through online learning, communication and discussion, group collaborative learning, and forum counseling and answering questions. In the process of solving problems, accumulated their own knowledge and transformed it into their own learning results.
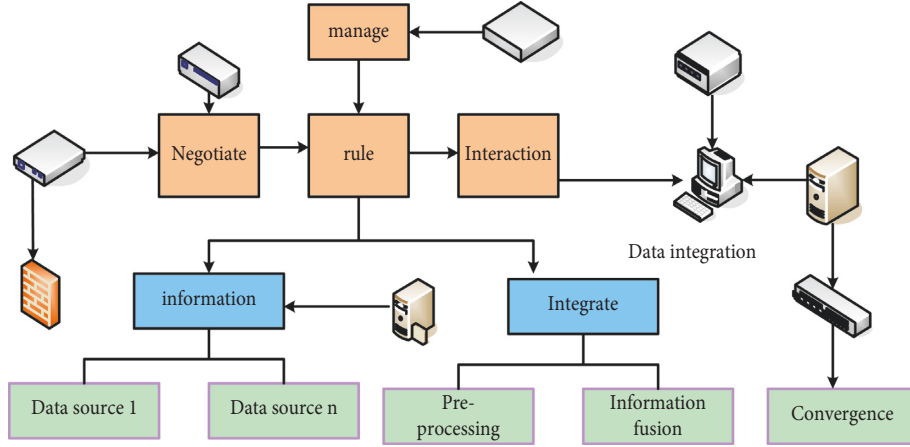
FIGURE 1: The process of student self-learning.

(5) Learn to evaluate one's own learning outcomes.

Network-based self-directed learning no longer pays attention to the measurement of the performance. This kind of summative evaluation focuses more on the evaluation of the learning process and pays more attention to the growth of students themselves. Through the evaluation of staged learning outcomes, more attention is paid to the growth of students, so that students can recognize their own changes in this stage, so as to affirm and accept themselves.

Use Y to represent the weighted comprehensive score of a certain course [18]:

$$Y = \frac{\sum (X \times C)}{\sum (\gamma C)}.$$ (1)

There are n students, and each student has m course grades [19].

$$C = \begin{bmatrix} c_{11} & \cdots & c_{1m} \\ \cdots & \cdots & \cdots \\ c_{n1} & \cdots & c_{nm} \end{bmatrix}.$$ (2)

Get the normalized performance evaluation matrix [20]:

$$B = \begin{bmatrix} b_{11} & \cdots & b_{1m} \\ \cdots & \cdots & \cdots \\ b_{n1} & \cdots & b_{nm} \end{bmatrix}.$$ (3)

The row vector is X:

$$\begin{aligned} X &= (b_{il}, b_{i2}, \ldots, b_{im}), \\ W &= (w_1, w_2, \ldots, w_n). \end{aligned}$$ (4)

W is the normalized weight vector [21].

When comprehensively evaluating the grades of each subject of the ith student, the configuration is made according to the grades of each subject of the student.

Construct variable weight formula w_{mn}:

$$w_{mn} = w_m + \frac{w_n}{2} \left(\sum wb - b \right).$$ (5)

When the variable weight vector is used to synthesize the students' scores in various subjects, the normalized comprehensive score of the ith student is [22]

$$G = \sum \left(w_{mn} * b_{ij} \right).$$ (6)

Given a dataset [23] containing n d-dimensional data,

$$M = (m_1, m_2, \ldots, m_n).$$ (7)

Each cluster can be represented as

$$S = \{ S_i, i = 1, 2, 3, \ldots, k \}.$$ (8)

The Euclidean distance generally refers to the Euclidean metric. In mathematics, the Euclidean distance or Euclidean metric is the "ordinary" (that is straight line) distance between two points in Euclidean space) is used as the judgment criterion, such as the following formula [24]:

$$V = \sum \sum \left(x_j - r \right)^2.$$ (9)

3.4. Establishment of the University Practical English Website. The University Practical English website broadens the content of classroom teaching and students' horizons and provides favorable conditions for students' autonomous learning.

The teaching materials used by the researchers in this experiment are 21st century college practical English, including listening and speaking courses and reading and writing courses. All have their own characteristics, and the three forms complement each other. As a tool, the practical English teaching Website can promote the improvement of students' four abilities of listening, speaking, reading, and writing. At the same time, students can also obtain useful resource on cultural background, author's personal profile, and some other information from the website. What is more, there are many "practice modules" individually designed for students within the university practical English website. For example, if students want to improve their writing skills, they can enter the "writing module." In the writing module, students are provided with writing examples and also

provided with writing frameworks, key vocabulary, connection words between contexts, guiding words, and specific writing requirements. The university has purchased the right to use the "Juku correction network" for students. Students can register and log in to practice writing on this writing platform. The advantage of the Juku correction network is that students will see their scores immediately after they finish writing their compositions online and click submit, and each sentence will have specific comments, which is very convenient and practical. Students can revise the composition according to the comments. And in the process of repeated revision, the students' writing level will be greatly improved. In addition, in order to exercise students' speaking ability, the network platform also designed a "speaking chat module." In this module, students can correct their English pronunciation very well, and improve their language appearance. Besides, the module also provides the opportunity for students to practice their oral English. The topic of oral practice can be generated from the widely discussed topics in the campus network, which can be decided by students' discussion and can also be designated by classroom teachers.

In the "listening practice module," students can choose online listening materials from VOA and BBC for English listening practice, whereas appreciating American dramas, the students also strengthened their understanding of Western culture. VOA generally refers to the Voice of America radio station, that is, the Voice of America (abbreviated as VOA). Voice of America is a dynamic international multimedia radio station with services in 45 languages. They can listen and watch with all their heart and mind, and no longer consider the teacher's requirements, the pressure of exams, and other issues, but instead promote the improvement of their own language proficiency. At the same time, we have a speech rate adjustment button in the listening module of the network platform. Students can adjust it according to their listening level. Another unique area is the "forum" area. Teachers can provide students with a topic. And students can freely express their opinions in this area and conduct further discussions on this topic. Teachers can register and log in to this forum to give further answers to some questions raised by students. The forum provides a good platform for communication and exchange between teachers and students. In the classroom, introverted students may have some ideas in their hearts. But because they are not good at expressing themselves, extroverted students occupy most of the class time. However, this situation can be effectively avoided on the forum. Students, whether introverted or extroverted, can freely express their opinions on the forum. This can greatly stimulate students' enthusiasm for learning. Teachers can also use the forum to better understand students' ideas. If students want to further review what they have learned after class, teachers can provide students with corresponding knowledge point analysis, review of key and difficult points, chapter matching exercises, and detail analysis of exercises on the forum platform. With the help of the online teaching platform, students can answer exercises online, click the submit button, and the system will automatically evaluate according to the correct answers. Students

can get timely feedback without waiting too long. The network teaching platform not only benefits the students, but also has a positive impact on the teaching effect of teachers. Teachers can monitor the students' learning process in real-time and provide timely feedback. In this study, the subjects from the experimental class can enter the network platform for learning. At the beginning of the experiment, the researchers will train the students in the experimental class how to use the network platform. The difference is that the students in the control class still use traditional teaching methods, while the students in the experimental class use the network platform to learn independently under the guidance and supervision of the researchers. In this process, the supervision and guidance of teachers is added. In the experiment, the researchers combined the above three methods. Among them, personal growth profile is a window for teachers to understand the progress of students, e-mail is a tool for teachers and students to communicate, and the university practical English website provides a broad platform for teachers and students to interact [25].

Regularity of logging into the system R_G is written as

$$R_G = \sqrt{\frac{\sum (\text{interDur} - \chi)}{N - 1}},$$

$$\text{interDur} = T^{i+1} - T^{i+1}, \tag{10}$$

where interDur represents the interval from the ith log out to the $i + 1$st log in to the system.

Concentration state duration T_C in a single study session is written as follows:

$$T_C = \frac{1}{2}\left[1 + \text{sgn}(t_1 - t_1)\right]t_m,$$

$$T_C = \frac{1}{2}\left[1 + \text{sgn}(t_1 - t_1)\right]t_m, \tag{11}$$

where t_2 represents the time that the window remains active and t_3 represents the time threshold for determining the focus state [26].

Average length of post reply content F_H is written as

$$F_H = \frac{\sum P + \sum R}{P_N + P_U}, \tag{12}$$

F_Z of the total number of posts is

$$F_Z = \frac{P}{T} \times 100\%. \tag{13}$$

Homework average Z_P is

$$Z_P = \sum \frac{S}{N}. \tag{14}$$

Calculate the Pearson correlation coefficient matrix for all indicators:

$$R_{ij} = \frac{\text{Cov}(x_i, x_j)}{s_i s_j} = \frac{\sum (x_i - x_j)(y_i - y_j)}{\sqrt{\sum (x_i - x_j)^2 (y_i - y_j)}}. \tag{15}$$

Z-score normalization is a common method of data processing. Through it, data of different magnitudes can be converted into a unified measure of *Z*-score for comparison. The commonly used standardization method is the *Z*-score standardization method, and its calculation formula is

$$x_{ij} = \frac{x_{ij} - \min(x_i)}{\max(x_j) - \min(x_i)}. \tag{16}$$

3.5. Evaluation of College English Autonomous Learning Ability. The evaluation framework of college English autonomous learning ability is shown in Figure 2. The evaluation of freshmen entering the school is mainly based on individual scores such as English, a certain comprehensive index such as psychological quality evaluation, physical quality evaluation, and specialty evaluation. The evaluation of the freshmen's English proficiency mainly depends on the English proficiency test and the self-evaluation of college students. The evaluation goal is to achieve hierarchical teaching and to determine the English proficiency training plan suitable for undergraduate freshmen and the adjustment of the relevant training plan. This form of evaluation is only a means, rather than labeling by evaluation. After a semester of the study, adaptable and studious students can skip a level and enter advanced English courses. The psychological quality evaluation of freshmen is mainly based on high school portfolios, psychological interviews, and questionnaires. This evaluation is conducive to timely discovery of the psychological distress, potential psychological problems and life difficulties of college students when they are far away from their parents and the sudden change of their living environment, so as to solve the difficulties faced by college students in a targeted manner. In the whole process of cultivating college students' autonomous learning ability, there are various evaluation targets for different evaluation subjects and different stages. In these evaluation processes, the students who are the object of evaluation may also become part of the subject of evaluation.

In the process of comprehensive quality evaluation of college students, the formation of evaluation conclusions and the application of evaluation results are one of the key problems faced in the evaluation process. The forming principles, main methods, and forming process of the conclusion of comprehensive quality evaluation of college students should be open and transparent, which allow college students to participate in this process to determine the purpose of evaluating college students and the method of using the evaluation results through negotiation. Different colleges may emphasize different goals and objectives, but the most important principle is that all colleges should adhere to the basic goal of increasing college students' knowledge and developing college students' potential. Colleges and universities should take the development of college students as the most important goal, and must pay attention to the feedback of the comprehensive quality evaluation information of college students, and pay attention to the progress of college students and the effectiveness of teaching by using feedback information. The scope of comprehensive evaluation

objectives and information should be announced at the beginning of evaluation, and implemented after reaching a consensus through consultation. By systematically collecting, analyzing, and interpreting information, it identifies performance and gaps of college student between expectations and goals. Through the use of appropriate negotiation and feedback strategies and information obtained from evaluation, teachers and administrators of colleges and universities can understand the learning and the development status of college students, so as to improve the learning of college students. College students should not only see the horizontal gap with their classmates, but also understand the progress after vertical comparison and the gap with the goal. At the same time, it can also exercise the self-evaluation and reflection ability of college students through dynamic evaluation and other information in the training process of senior students and even graduates, so as to form the encouragement of the footsteps of others in the past, and the confidence of self-improvement and self-transcendence in the future.

3.6. Self-Directed Learning Ability Test

3.6.1. English Proficiency Test. The researchers tested the English proficiency of the experimental class and the control class twice before and after the experiment to verify whether the English proficiency of the two classes had changed. Students from the experimental class and the control class were required to take two English proficiency tests. Points are given on a percentage scale. The pretest is carried out at the beginning of the freshmen's semester to test the students' English scores to ensure that the two classes have the same level of English; the posttest is an online test mode developed by the researchers according to CET-4 question types, in order to verify the experimental results. After a semester-long self-learning experiment in which personal growth files, emails, and college practical English websites are introduced into teaching, the English proficiency and self-directed learning ability of the students from the experimental class are improved by comparing with the experimental subjects from the control class.

The pretest results are shown in Table 1. The average scores of the two classes are almost the same, the control class is 66.9 and the experimental class is 66.8. From Table 1, we can see that the highest score of the control class is 77 and the lowest score is 68; while the highest and lowest scores of the experimental class are 79 and 61, respectively. The standard deviations of the two classes are 4.112 and 3.886, which are roughly the same, which indicates that the two classes have the same level of English before the test.

3.6.2. Questionnaire Survey. In the experiment, the researchers compiled two sets of questionnaires, which were used to measure the students' autonomous learning ability and students' learning motivation in the process of autonomous learning. In order to ensure the reliability of the research results, the self-directed learning ability questionnaire used the "college students' self-directed English learning survey." Before being tested, the researcher
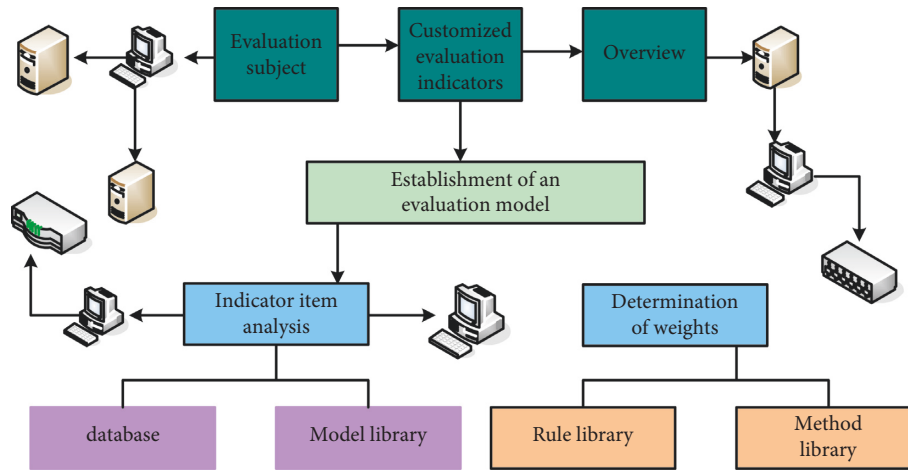
Figure 2: Evaluation framework of college English autonomous learning ability.

Table 1: Pretest results.

Parameter	Experimental class	Control class
Mean	66.8	66.9
Mini	61	79
Max	68	77
Std. error mean	3.886	4.112

informed the experimental subjects that this questionnaire was anonymous, and the experimental subjects did not have to be psychologically burdened and could answer according to their own wishes. During the selection process, if the subject's expression on the topic was unclear, they could seek the help of the researchers.

3.6.3. Data Software Processing. SPSS is the social science data analysis software package. The researchers use the SPSS statistical software to analyze the data. The version used in this study is SPSS17.0. PSS17.0 is a free online data analysis platform, which can be used online without downloading. It provides commonly used data analysis methods, correlation, regression, variance clustering, factor, and other algorithms. It can generate analysis and interpretation with one click, which is easy to read and understand the analysis reports.

4. The Results of College English Online Self-Learning Ability Training

Among the 178 students, 86 students are interested in learning English, accounting for about 48% of the total, and 92 students are not interested, accounting for about 52% of the total. 78 students think it is necessary to learn English, accounting for about 43.8% of the total; 100 students think it is not necessary to learn English, accounting for about 56.2% of the total. It can be seen that many students are not willing to learn English because of their incorrect motivation for learning English and unclear goals for English learning. The survey of students' interest and necessity for English learning is shown in Figure 3.

According to the survey, there were 19 students who believed that their English scores were excellent, accounting for 10.6% of the overall proportion; 38 students were good, accounting for 21.3% of the overall proportion; 89 students were ordinary, accounting for 50% of the overall proportion; 32 students had poor English grades, accounting for 17.9% of the total. The survey of students' self-perceived English score is shown in Figure 4.

96 students indicated that they had specific learning goals, while 82 students believed that the goals of English learning were not clear. And in the case of multiple choice, 163 students chose to learn English with the goal of taking credits in the exam, 59 students were because of their own interests, 42 students felt that they could cultivate their abilities, and 11 students were preparing for going abroad. A survey of student learning goals is shown in Figure 5.

The main way to learn English is that there are four options: class, training, self-study, and others. Among the 178 students, 156 students choose to take classes, 10 students choose training, 4 students choose self-study, and 8 students choose others. The main ways of learning English are shown in Table 2.

In descending order, only 2.1% of the students spend 5-6 hours/day studying English after class, and 8.6% of the students can study for 3-4 hours. Most of the students who study 1-2 hours/day account for 27.1% of the total, and 62.2% of the students only spend less than or equal to one hour for extracurricular English learning, which is obviously insufficient time. The survey of English learning time after school is shown in Figure 6.

In the evaluation of students' English autonomous learning ability in the network environment, only the part of understanding teachers' teaching objectives and classroom requirements has an average value of 3.926, which is the part with the highest score among the five parts of this questionnaire. This shows that students can understand the teacher's teaching goals, and can keep up with the teacher's teaching ideas and pace in the classroom. Students are aware of the necessity of doing so, but in comparison, their ability to transform the teacher's general teaching goals into specific learning goals suitable for them is still relatively weak, which
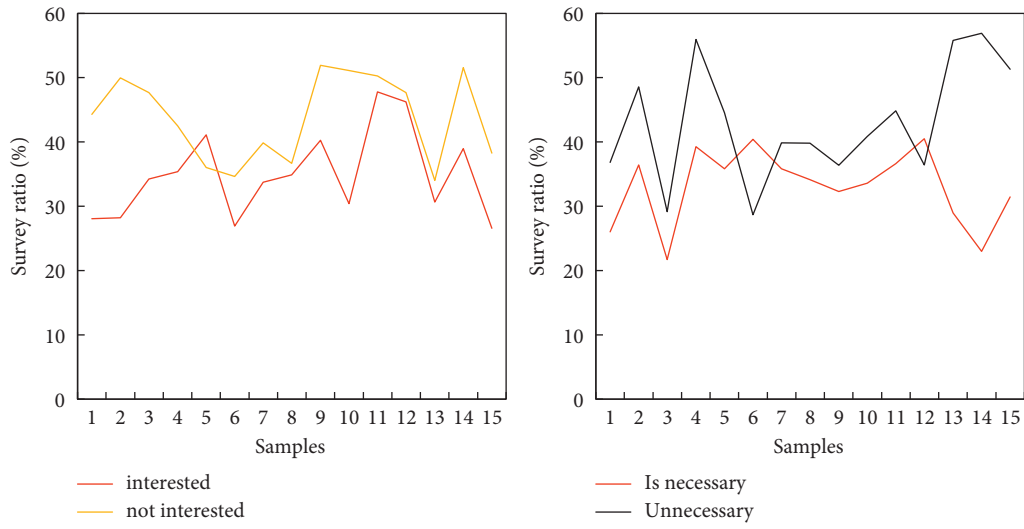
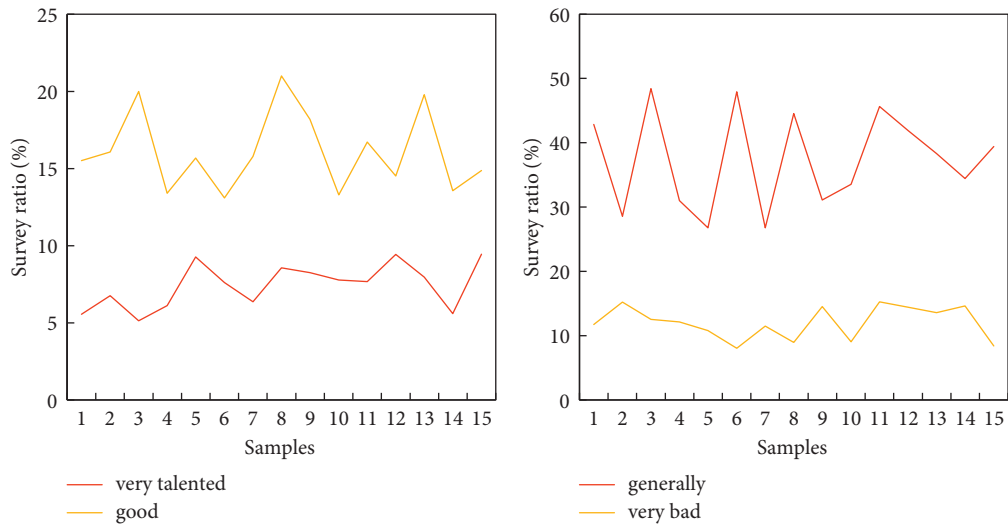Figure 3: Students' interest and necessity for English learning.

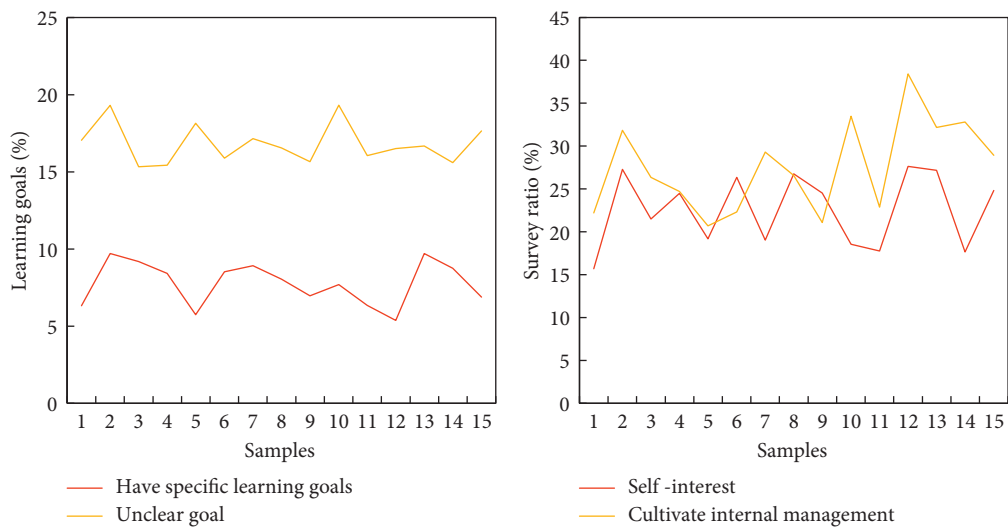Figure 4: Survey of students' self-perceived English score.

Figure 5: Survey of student learning goals.

TABLE 2: Main ways to learn English.

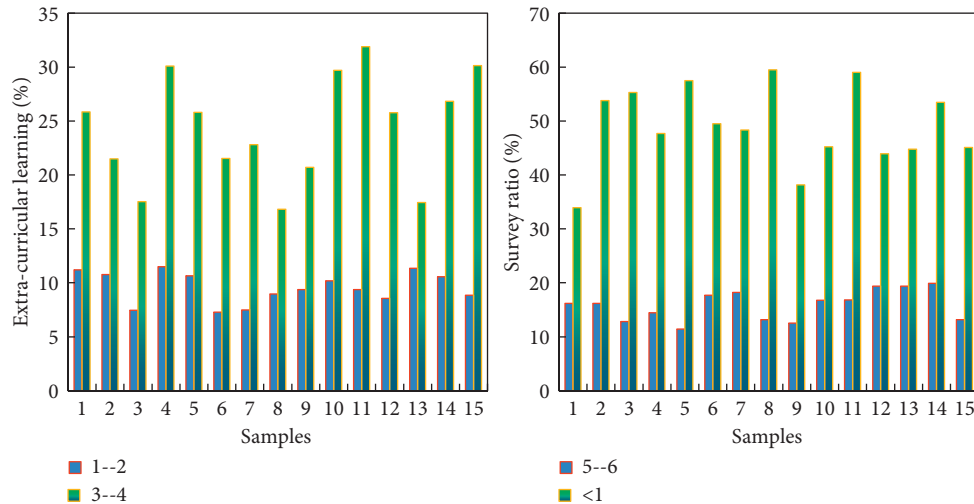| Option	Number of people
Attend class	156
Train	10
Self-study	4
Others	8

FIGURE 6: Survey of English study time after school.

leads to a passive acceptance learning mode by students. What the teacher explains, the students passively accept what they have, and the self-learning ability is poor. The survey of autonomous English learning is shown in Figure 7.

The survey for setting learning objectives and learning plans is shown in Figure 8. The average value of the second part of the questionnaire on students' autonomous learning ability is 3.676, which is the lowest score among the five parts in the whole questionnaire. The research results show that in the five aspects of students' autonomous learning ability, the ability of students to formulate learning plans suitable for their own learning goals is still relatively poor, and only a small number of students adjust their learning plans when necessary. In addition, the second part has the lowest score, which also shows another problem. Students are not familiar with the learning requirements that the college English syllabus puts forward for students at the university stage, so they cannot make their own study plans according to the syllabus.

It can be seen that the highest scores of the control class and the experimental class are 90 and 86, respectively, which indicates that the highest score of the control class is 4 percentage points higher than that of the experimental class. The minimum scores of the control class and the experimental class are 49 and 65, respectively, and the control class is 6 percentage points lower than the experimental class. The average scores of the two classes are 73.6 and 78.4, which indicates that the average score of the experimental class is 4.8 points higher than that of the control class, and the standard deviations of the two classes are 8.05 and 6.51,

respectively. These data show that after a semester-long teaching reform, the English scores of the students in the experimental class are significantly different from those in the control class. After the introduction of the new teaching method under the network condition for one semester, the English level of the students in the experimental class has been significantly improved by comparing with that of the students in the control class. The score comparison between the control class and the experimental class is shown in Figure 9.

Similar to pretest analysis, the researchers conducted an independent sample t-test in order to make the data differences more significant and to obtain clearer data. The test results are shown in Table 3.

Table 3 also contains two sets of analysis data: one is the analysis results under the assumption that the variances of the two groups are equal; the other is the analysis results under the condition that the two groups have unequal variances. First, from the results of the Levenes test for equality of variances, we can see that the sig value is 0.431, which is greater than 0.05, which indicates that the overall variance between the two groups is not significantly different, that is, the assumption that the variances of the two groups are equal is true. When performing a group test for comparing the means of two samples, it is firstly necessary to test whether the variances of the two populations are equal, which is called the homogeneity of variances. So, the researcher adapt the data of the group that assumes that the variances of the two groups are equal (equal variances assumed). It can be seen that the value of sig (2-tailed) in the
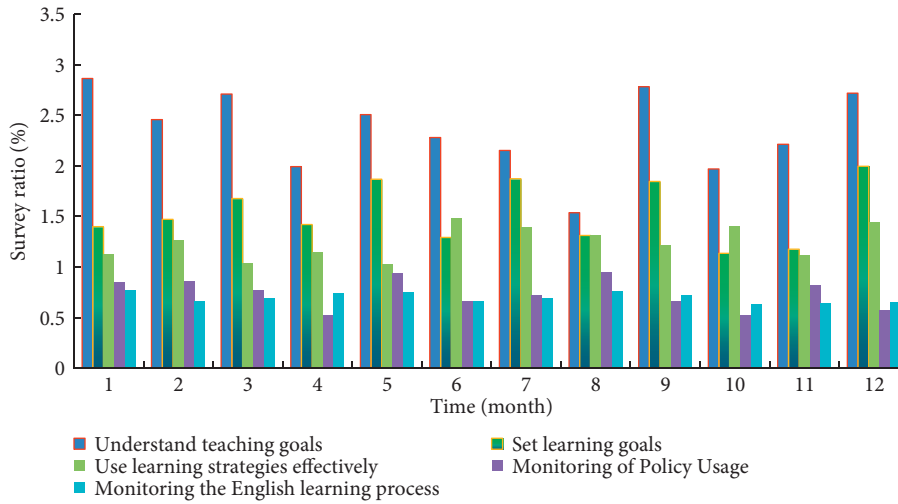
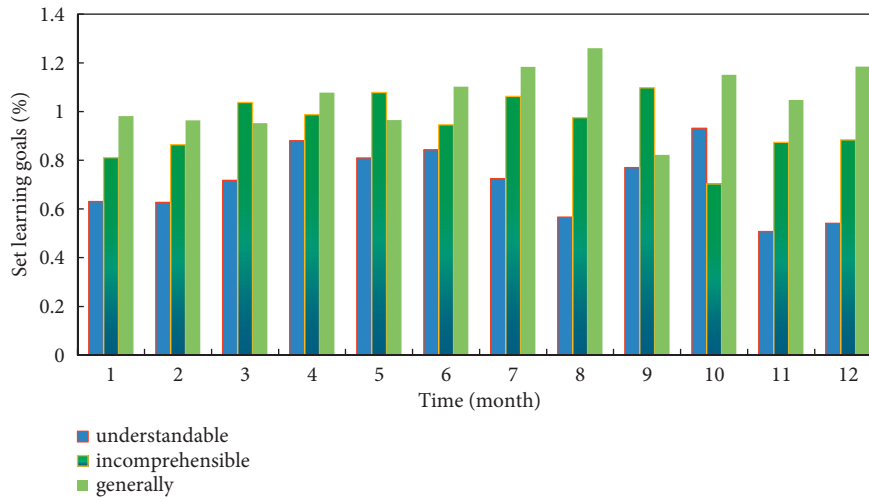Figure 7: Survey on autonomous English learning.

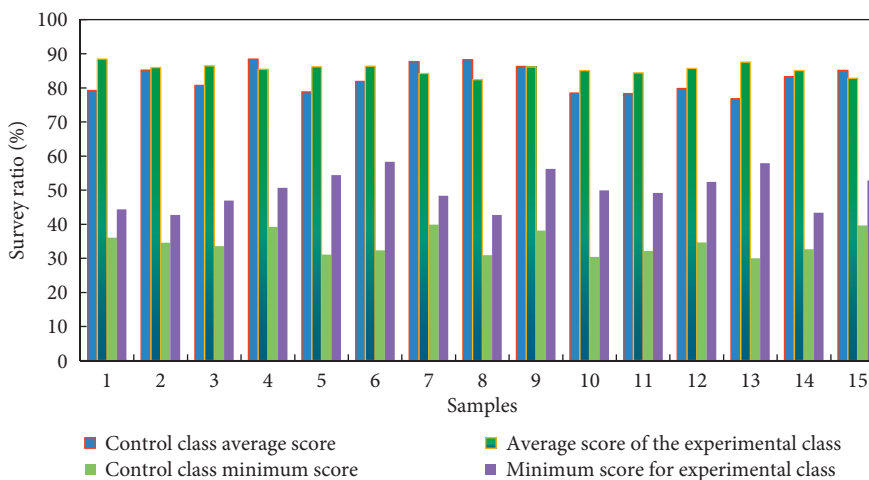Figure 8: Survey for developing learning objectives and learning plans.

Figure 9: Comparison of scores between the control class and the experimental class.

TABLE 3: *T*-test results.

Posttest	*T*	Sig. (2-tailed)	Mean difference
Equal variances assumed	2.993	0.004	4.633
Equal variances not assumed	2.956	0.004	4.633
Others	2.889	0.005	4.665

t-test (The *t*-test is mainly used for a normal distribution with a small sample size (for example, $n < 30$) and the population standard deviation σ is unknown.) is 0.004, which is less than 0.05. Therefore, it is concluded that there is a significant difference in the posttest results of the two classes, which shows a significant difference. That also verifies the original hypothesis: the English level of the subjects in the experimental class has been significantly improved by comparing with the subjects in the control class after a semester of online English teaching experiment.

5. Conclusion

One of the goals of college English teaching is to cultivate learners' autonomous learning ability. Network teaching has been introduced into college English teaching. Therefore, many universities have established college English teaching platforms. Learning motivation is an important factor affecting autonomous learning ability. There are many factors that affect autonomous learning, which can be roughly divided into three categories: internal factors, behavioral factors, and environmental factors. At present, many researchers have conducted research on the correlation between English learning motivation and autonomous learning ability, but there are few researches on the correlation between the two among college students based on the network environment. In this study, a questionnaire for college students' English autonomous learning strategies based on the network background is formulated through literature reading and other methods. Through SPSS data processing, this study analyzes the differences in the use of autonomous learning strategies among students of different genders, origins, and English proficiency. The interview method is also used to interview some students and teachers in order to further explore the current situation of college students' English autonomous learning and the reasons behind it. Teachers and students should change their previous ideas of English learning. Teachers are not only teachers but also counselors, facilitators, and learning resources. At the same time, students should also be responsible for their own learning and strive to become autonomous learners. This study do not conduct a detailed survey of students. In future work, on the basis of empirical research results, it is necessary to increase the selection of research objects for the problem that the research cases are typical but not representative of the whole. And select more different types of online learning platforms for secondary vocational students, so as to continue to expand the sample size of the study and increase the general applicability of research conclusions.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The author declares no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

[1] N. O. García and Q. Li, "Remote academic platforms in times of a pandemic," *International Journal of Emerging Technologies in Learning*, vol. 16, no. 21, pp. 121–131, 2021.

[2] S. Ivanaj, G. Nganmini, and A. Antoine, "Measuring E-learners' perceptions of service quality," *Journal of Organizational and End User Computing*, vol. 31, no. 2, pp. 83–104, 2019.

[3] K. Y. Chau, K. M. Law, and Y. M. Tang, "Impact of self-directed learning and educational technology readiness on synchronous E-learning," *Journal of Organizational and End User Computing*, vol. 33, no. 6, pp. 1–20, 2021.

[4] T. Hester and P. Stone, "Intrinsically motivated model learning for developing curious robots," *Artificial Intelligence*, vol. 247, no. Jun, pp. 170–186, 2017.

[5] S. E. Azwar, "Development of learning device based contextual teaching and learning based on the context of aceh cultural to improve mathematical representation ability[j]," *International Journal Of Advance Research And Innovative Ideas In Education*, vol. 3, no. 2, pp. 3231–3241, 2017.

[6] F. Faez and M. Karas, "Connecting language proficiency to (Self-Reported) teaching ability: a review and analysis of research," *RELC Journal*, vol. 48, no. 1, pp. 135–151, 2017.

[7] D. M. Keister, S. E. Hansen, and J. Dostal, "Teaching resident self-assessment through triangulation of faculty and patient feedback," *Teaching and Learning in Medicine*, vol. 29, no. 1, pp. 25–30, 2017.

[8] A. Wain, "Learning through reflection," *British Journal of Midwifery*, vol. 25, no. 10, pp. 662–666, 2017.

[9] F. Xiao, "Multi-sensor data fusion based on the belief divergence measure of evidences and the belief entropy," *Information Fusion*, vol. 46, pp. 23–32, 2019.

[10] H. Huang, Y. Liu, and X. Zhao, "Multi-layer multi-source information fusion algorithm for hovering UAV height measurement[J]," *Zhongguo Guanxing Jishu Xuebao/Journal of Chinese Inertial Technology*, vol. 26, no. 3, pp. 316–322, 2018.

[11] Y. Hu, Q. Shuai, and X. Xue, "Remaining useful life estimation based on asynchronous multisource monitoring information fusion[J]," *Journal of Control Science and Engineering*, vol. 2017, no. 2, Article ID 4139563, 2017.

[12] E. L. Kunst, M. Mitchell, and A. Johnston, "Using simulation to improve the capability of undergraduate nursing students in mental health care," *Nurse Education Today*, vol. 50, no. Complete, pp. 29–35, 2017.

[13] S. S. Harahap and S. E. Hasratuddin, "The development of learning devices based realistic approach for increasing problem solving mathematics ability of student in SMPS gema buwana[J]," *International Journal of Innovative Science and Modern Engineering*, vol. 5, no. 5, pp. 2347–9051, 2017.

[14] G. V. Milovanova, I. V. Kharitonova, S. N. Kharitonova, S. N. Fomina, and A. F. Dayker, "Assessing self-study work's

significant skills for successful learning in the higher school," *Integration of Education*, vol. 21, no. 2, pp. 218–229, 2017.

[15] Z. Lv and H. Song, "Trust mechanism of feedback trust weight in multimedia network," *ACM Transactions on Multimedia Computing, Communications, and Applications*, vol. 2021, Article ID 3391296, 2021.

[16] Z. Wan, Y. Dong, Z. Yu, H. Lv, and Z. Lv, "Semi-supervised support vector machine for digital twins based brain image fusion," *Frontiers in Neuroscience*, vol. 15, Article ID 705323, 2021.

[17] M. Zambelli and Y. Demirisy, "Online multimodal ensemble learning using self-learned sensorimotor representations," *IEEE Transactions on Cognitive and Developmental Systems*, vol. 9, no. 2, pp. 113–126, 2017.

[18] Y. Liu, B. Ferrell, J. Barbera, and J. E. Lewis, "Development and evaluation of a chemistry-specific version of the academic motivation scale (AMS-Chemistry)," *Chemistry Education: Research and Practice*, vol. 18, no. 1, pp. 191–213, 2017.

[19] J. Brown, G. Collins, and O. Gratton, "Exploring the use of student-led simulated practice learning in pre-registration nursing programmes," *Nursing Standard*, vol. 32, no. 4, pp. 50–58, 2017.

[20] S. E. Rusmini, "The effect of contextual learning approach to mathematical connection ability and student self-confidence grade viii smp negeri 8 medan[J]," *International Journal of Sciences: Basic and Applied Research*, vol. 35, no. 2, pp. 249–262, 2017.

[21] H. M. Lai, Y. L. Hsiao, and P. J. Hsieh, "The role of motivation, ability, and opportunity in university teachers' continuance use intention for flipped teaching," *Computers & Education*, vol. 124, no. SEP, pp. 37–50, 2018.

[22] J. Airey, K. M. Lauridsen, and A. Nen, "The expansion of English-medium instruction in the Nordic countries: can top-down university language policies encourage bottom-up disciplinary literacy goals?[J]," *Higher Education*, vol. 73, no. 4, pp. 1–16, 2017.

[23] M. Amin, "(English language teaching methods and reforms in English curriculum in Iraq; an overview)[J]," *Journal of University of Human Development*, vol. 3, no. 3, pp. 578–583, 2017.

[24] Z. Wen, B. Wang, and D. Coniam, "Calibrating the CEFR against the China standards of English for college English vocabulary education in China[J]," *Language Testing in Asia*, vol. 7, no. 1, pp. 1–18, 2017.

[25] S. Kasuma, "Four characteristics of facebook activities for English language learning: a study of Malaysian university students' needs and preferences[J]," *Advances in Language and Literary Studies*, vol. 8, no. 3, pp. 155–171, 2017.

[26] Z. E. Aouri and B. Zerhouni, "Motivation and language learning strategies used by Moroccan university efl science students: a correlatioal study[J]," *Arab World English Journal*, vol. 8, no. 2, pp. 52–73, 2017.