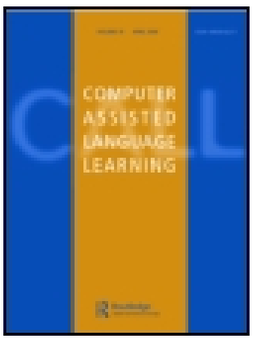

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Developing and integrating constructive CALL courseware for EAP in Chinese universities: a report on a case study

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ABSTRACT

This paper reports on the development of constructive EAP CALL courseware, and its integration into blended learning contexts, as a solution to the problems in EAP courses in Chinese universities. A case study of a defining skills package, developed for undergraduates at the University of Science and Technology Beijing (USTB), is used to illustrate the design and integration of the courseware. Guided by constructivist learning theory, the design draws on a synthesis of language-centered, academic skills-centered, content-based and task-based approaches. The integration is evaluated through the quality of students' written work and evidence of their satisfaction with their defining skills improvement and the CALL courseware, based upon the data from a questionnaire survey. Web-based digital tools and multimodal media have been exploited to devise and produce CALL materials on defining skills. After three weeks of blended learning, students' learning outcomes and satisfaction with the courseware and its integration were significantly positive.

KEYWORDS

Case study; Chinese universities; constructive CALL courseware; development and integration; EAP blended learning contexts

1. Introduction

Internationally, the area of English for Academic Purposes (EAP) has been central to the research endeavors of an increasing number of researchers and scholars since the turn of the 21st century (Arnó-Macià, Aguilar-Pérez, & Tatzl, 2020; Bi, 2020; Dong & Lu, 2020; Rao, 2018). In China, the Ministry of Education began, in 2001, an extensive promotion of bilingual teaching using English as the medium of instruction (EMI). Since then Chinese universities have been encouraged to develop EMI courses such as information technology, new materials technology, biotechnology, and business and management, convinced that this will enhance students' international competitiveness and equip them better

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for international cooperation and exchange (Gill & Kirkpatrick, 2013; Sun & Xu, 2012). This orientation has posed intense pressure on disciplinary faculty who have no professional training in language pedagogy as well as on College English teachers who have no disciplinary backgrounds. The quality and efficiency of the EMI courses have also been a matter of serious concern for both instructors and students. To facilitate students' academic learning and career paths in English, EAP courses have been introduced in a small number of top universities in China. With the rising need for EMI, and with research-informed practice in higher education contexts, EAP instruction has become more emphasized in recent years in universities across China. An important goal of foreign language education identified by China's Ministry of Education is to enhance students' communicative competence in academic contexts. Academic communicative competence, including language skills such as listening, speaking, reading and writing, and academic skills such as defining, reviewing literature, synthesizing, discussing, etc., are essential for academic success in EAP pedagogy and assessment. However, the majority of universities have not yet resolved how to best cope with the pressure of helping Chinese students participate in such academic activities with ease and success (Cai & Liao, 2010; Qin, 2003; Yang, 2010).

Unlike teaching English for General Purposes (EGP), which focuses primarily on vocabulary, structure and general language skills, EAP grounds English language teaching (ELT) in the cognitive, linguistic and social demands of target academic situations (Benesch, 2001; Hyland & Hamp-Lyons, 2002), with the specific aim of helping learners study or research in English (Flowerdew & Peacock, 2001), or of helping students participate in higher education. In other words, EAP meets the needs of learners who learn English for communication in their own fields of study. However, some problems remain unsolved in the development and implementation of EAP courses in Chinese universities. (1) Scholars and researchers have discussed extensively the paradigm shift from EGP to EAP (Cai, 2020), but little has been written about EAP instruction from the perspectives of practitioners who prepare students for education and research in English or who face various struggles and challenges in this regard. (2) There is a lack of locally informed and situated academic approaches which interface language and academic practices in the course design. EAP courses have been introduced in several universities, but these courses generally follow two different patterns which, unfortunately, are not feasible in most universities due to a lack of highly qualified teachers. The first is typical British EAP practice, often applied in international joint university programs with native speakers

of English as instructors, the most influential being those of the University of Nottingham Ningbo, China (UNNC) and Xi'an Jiaotong Liverpool University (XJTLU) (Gao & Bartlett, 2014). The second is a hybrid model, implemented in a small number of top state-owned universities, such as Fudan University, where EAP courses have been designed on the basis of ESP, with stronger orientation towards target academic disciplines, such as Academic English for Humanities, for Social Sciences, for Business, for Medicine, and for Science and Engineering (Cai, 2012). This pattern poses huge challenges for language teachers with no disciplinary knowledge, and is therefore not feasible and applicable in the majority of universities in China. (3) There is a discrepancy between the increased workload for EAP courses and the reduction in associated credits and classroom hours in most Chinese universities. EAP learning, therefore, poses new challenges to most Chinese students who have long been instructed by test-oriented pedagogy.

Guided by constructivist learning theory and informed by the results of needs analysis, this study develops and evaluates EAP CALL courseware in its integration into blended learning contexts, interfacing language and academic practices by drawing on a synthesis of language-centered, academic skills-centered, content-based and task-based approaches through the lens of communicative functions of language in academic practices.

2. Purpose of the study

Considering the afore-mentioned problems, two main research goals in the present study were established: (1) to illustrate, via a case study of a defining skills package, the design and development of constructive EAP CALL courseware; (2) to integrate the courseware into a blended learning context, assessing students' progress in academic writing, and surveying students' perceptions of their learning outcome. The study seeks further to examine the role of constructive EAP CALL courseware in solving the problems confronted by most Chinese universities in the development and implementation of EAP courses. The following research questions guide this study:

1. How can EAP CALL courseware be developed and integrated into a blended learning context to address the problems in EAP courses in Chinese universities?
2. How do the EAP learners in question perceive their learning outcome in the blended EAP instruction?

3. Methodology

The study was divided into three phases: needs analysis, the design and the structure of constructive EAP CALL courseware, and the integration of the courseware into blended learning contexts.

3.1. Needs analysis

Analysis of needs from the learner's perspective is a vital part of any instructional project design (Lytle, 1988). Hamp-Lyons (2001) points out that EAP begins with the learner and the situation, whereas EGP starts with the language. Therefore, identifying students' learning needs is a good point of departure for designing an EAP course, tasks and materials (Flowerdew & Peacock, 2001). In our study, the needs analysis draws on three strands of theoretical insights. The first is the learning-centered approach proposed by Hutchinson and Waters (1987), which considers the learning situation and how learners learn. It also takes into account the insights of Munby (1978) on communicative syllabus design; these are very much language-centered and focus on the target situation. The needs analysis also draws upon the application of genre analysis (Swales, 1990; Swales & Feak, 2012) for the developing of academic skills-centered materials and tasks.

3.1.1. Analysis of local learning situations

Following Hutchinson and Waters' approach, this project was first conceived as a response to massive requests from undergraduates and postgraduates, as well as from teachers across disciplines at the University of Science and Technology Beijing (USTB) for the improvement of students' academic communication competence in both spoken and written English. For various reasons from institutional demands to instructional necessities, a decision was made to develop constructive CALL courseware for the blended EAP courses at USTB; the defining skills package is the first courseware in this project.

3.1.2. Analysis of learner groups

Applying Munby's operational instrument, three main types of learners at USTB have been identified as end-users of the CALL courseware. The majority are first-year science, engineering and business students who are taking EMI courses and a blended EAP course regularly. Another group consists of students of other majors, who have advanced English proficiency and expect to study abroad upon graduation. The third group comprises postgraduates who are using English as a medium of research, whether reading English research articles, attending

disciplinary lectures delivered in English, or planning to write and publish their research in English. It makes most sense to offer academic skills packages that are available to students and can fulfil their genuine needs in specific situations.

Addressing these learning needs, this research utilizes an online open course platform in China to devise a set of materials highly relevant and integral to a blended learning experience in an EAP instructional context.

3.2. Design and structure of the courseware

Based on the above analysis of learning needs, this section details the stages of our courseware design and proposes a synthesis of language-centered, academic skills-centered and learning-centered approaches. This part also illustrates with examples how different structural and functional aspects of definitions in academic writing, digital tools and multimodal media can be exploited to devise and produce CALL materials on defining skills. The procedures for developing the courseware are illustrated in Figure 1.

3.2.1. Identification of the learning focus

Applying Swales' genre analysis, academic skills such as defining, explaining, comparing, contrasting, analyzing, discussing, evaluating and synthesizing are identified as fundamental for Chinese students to communicate effectively in academic settings, both in writing and in oral presentation.

This learning focus resonates with Chapelle's (1998) suggestions for a multimedia CALL based on the hypotheses about the ideal conditions for second language acquisition. The importance of defining skills for EAP learners is highlighted in relation to the ideational, interpersonal and textual functions of definitions in academic settings. The defining skills package is designed and developed with both the communicative functions of definitions and their linguistic realizations considered. This

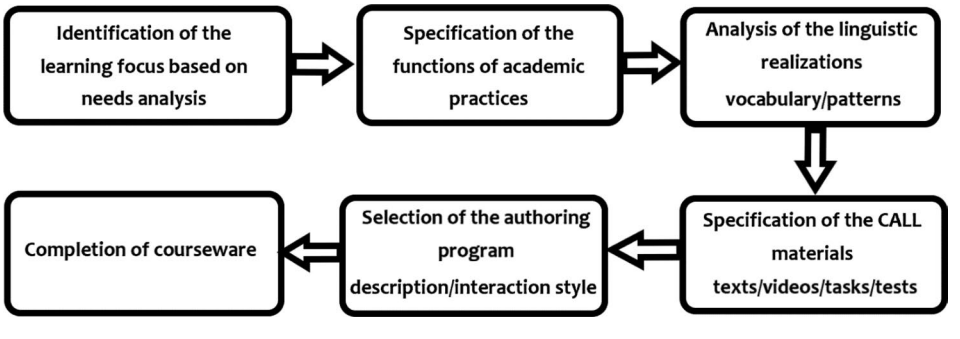


Figure 1. Basic steps to develop the courseware.

consideration follows Chapelle's (1998) second suggestion for a multimedia CALL that it should help learners to comprehend the semantic and syntactic aspects of the linguistic input.

3.2.2. Functional specification of materials

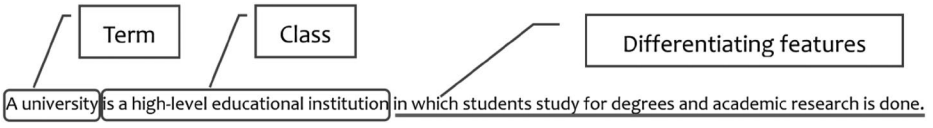
Definitions have been studied since ancient times (for example, Aristotle) in an attempt to understand the essence of things (real definitions) and the meanings of words (nominal definitions) (Triki, 2019). They are used in almost all academic genres and in both spoken and written academic discourses and texts (Flowerdew, 1992). By definitions, writers and speakers elaborate on explanations of key terms, ideas, concepts, etc., to provide clarity and highlight the pertinence of the research findings. Definitions have various structural and functional realizations, and are considered as a recurrent 'function' and one of the 'syndromes' of scientific writing in both its popular and academic forms (Halliday & Martin, 1993).

According to Halliday (1988, 1994), defining units (clauses), like most English clauses, are intrinsically multifunctional. They express different kinds of meaning simultaneously, among which ideational meaning (e.g. experiential and logical knowledge of the world represented in definitions), interpersonal meaning (i.e. realized in the mood and modality of defining units) and textual meaning (e.g. aspects of texture, or the information flow of definition texts) are the three metafunctional meanings (See examples in Harvey, 1999). In designing the CALL courseware for the defining skills package, the three metafunctions are given full consideration. In addition, this paper determines the functional specification of the materials by relying on a Swalesian (Swales & Feak, 2012) genre analysis of definitions in a corpus of academic writing and on the findings of the extant literature of definitions (Darien, 1981; Flowerdew, 1992; Harvey, 1999; Swales, 1981; Triki, 2019).

3.2.3. Linguistic realizations of definitions

Definitions have been found to vary from short and simple linguistic realizations to expanded and lengthy paragraphs or texts (Harvey, 1999; Swales & Feak, 2012; Triki, 2019; Trimble, 1985). The length and extent of a definition depend on its purpose, the level of familiarity that the audience has with the defined objects, and the extent to which there is an accepted common understanding of the term, thing, concept or notion. The smallest unit of a definition might be a short sentence, or a parenthetical addition to a sentence, while a large unit could be a substantial part of a paper, and the largest might be a whole paper, or even a whole book.

Whatever their length or extent, definitions usually have three basic elements: term, class and differentiating features (Harvey, 1999), as illustrated in the example below.



Example: Three basic elements of a definition.

The term is what is being defined, and the class is the broader category that the defined term belongs to. Both elements are realized linguistically through nouns or noun phrases. The differentiating features are what distinguish the defined term from other items in the same broad category. The linguistic realization of the differentiating features can be as short as a noun phrase or a prepositional phrase, and as long as a clause, a paragraph or even a text.

3.2.4. Specifications of the CALL materials

Accordingly, we used these specifications in designing the CALL materials. Four types of materials have been designed to construct the defining skills package.

3.2.4.1. Video lectures. The first type is a video lecture of 8-10 minutes, delivering essential knowledge on defining skills. Five video lectures are provided, focusing on different aspects of defining skills learning, including critical thinking, reading, listening, speaking, writing and the linguistic features of defining. Each video has accompanying exercises including multiple-choice or blank filling exercises that will pop up while the video is playing. This creates interaction between learners and the video content, with the instructional purpose of helping students check their understanding of the knowledge delivered.

3.2.4.2. Authentic academic texts and lectures. The second type includes authentic academic reading and listening materials with embedded tasks (e.g. note-taking, blank filling, multiple choice, etc.) that help learners focus on the forms, meanings and functions of definition during and after reading and listening.

3.2.4.3. Various tasks. The third type is a range of tasks that help consolidate the factual and procedural knowledge of defining skills. The tasks range from true or false questions, and writing simple definitions, to producing an extended definition of a term, concept or notion from the learner's own field of study.

3.2.4.4. Forum discussion. The fourth type is discussion related to defining skills, and topics for discussion are posted in the forum section of the online open course platform. In the online forum, learners can post questions and

share information and sources while interacting with teachers and other learners. The forum and learners' interactions thereby create an online learning community where students can construct knowledge through different learning and interactive experiences.

3.2.5. Selection and description of the authoring program

CALL courseware is an ideal medium for different learning situations, such as blended learning, self-access learning etc., as tasks can be worked through online and without the physical presence of teachers, which enables instructors and students to dispose of the limitation of classroom hours. The program occupies a critical position in the blended EAP course design, delivering course content and interacting with students, thus constructing an online community of EAP learning. It also serves as a self-access EAP learning center where learners are able to select materials relevant to their own learning and progress through the activities at their own pace. It refers to the potential use of the CALL courseware for self-access learners who do not have to cover all the learning materials and just need to select those relevant to their own disciplines. With the widespread use of online open course platforms in China's higher education, as in many other countries (Gimeno-Sanz, 2016), many Chinese universities have started to make optimal use of traditional classrooms by installing the latest CALL or MALL facilities (Gu, Zhang, & Gu, 2020; Jiang, Renandya, & Zhang, 2017; Tsai, 2019), either for self-access learning as part of course components, or for blended learning and flipped classroom learning. Various innovative authoring systems, such as MOODLE, open online course platforms and mobile learning applications (Zou, Li, & Li, 2018), are popular among English teachers since they require a minimal knowledge of software programming skills, thereby allowing teachers to develop a bank of courseware materials highly relevant to their students' learning needs within a short time span. However, a survey of the extant literature on EAP instruction reveals that existing CALL courseware is usually not systematically tailored to specific groups of learners. Therefore, there is an urgent need for the development of constructive CALL courseware whereby students can garner linguistic knowledge and academic skills through their own experience (Fosnot, 1996; Piaget, 1977) and according to their own specific learning needs.

The CALL materials were authored via iCourse (www.icourses163.org), which is China's most influential open online course platform, co-built by the Higher Education Press and NetEase in 2014 and responsible for the operation and management of China's national-level MOOCs (Massive Open Online Courses). Learners can register for free and access easily the CALL materials for the course. The defining skills package was implemented using the iCourse platform. It is a versatile program,

allowing the teacher to package different types of learning resources: multimodal resources including videos, audios, images, and texts; and different task types including multiple-choice, blank filling, true or false questions, short answer questions, and writing. For objective tasks such as multiple-choice and blank filling, the program gives instant feedback once learners submit their answers, and for subjective tasks like writing, the program supports both teacher feedback and peer review through which learners can offer and receive multiple comments and suggestions to improve their writing. Each function of the program has been exploited for a selection and presentation of different learning resources.

3.3. Integrating the CALL courseware into instruction

The CALL courseware was integrated as an essential part of the blended EAP courses at USTB, 'English for General Academic Purposes I' and 'English for General Academic Purposes II', for the first and second semester of freshman students respectively. The courses were conducted in a 'quadripartite model of a blended learning environment' (Wang, Chen, Tai, & Zhang, 2019), 2 h face-to-face classroom learning activities (as illustrated in Figure 6, 4.2.1) and self-paced online learning each week for sixteen weeks. The instructional design of the courses is illustrated as follows:

3.3.1. Instructional goals

A synthesis of the language-centered, academic skills-centered, content-based and task-based approaches, focusing on the development of students' academic skills and related receptive and productive language competencies in a series of tasks over a range of 16 topics. Defining is the first academic skill covered in this two-semester EAP course.

3.3.2. Target learners

Altogether 305 students participated in the present study. They were from different disciplinary backgrounds, including materials sciences, business and management, mechanical science, and law. They learned asynchronously at their own pace the CALL courseware authored via the MOOC platform, and then met face-to-face with a teacher and around 30 student peers in the classroom. The students in the classroom were involved in different learning activities that required higher-order thinking, such as discussion, group project, presentation and questioning, etc.

3.3.3. Learning goals

For each set of academic skills, the learning goals are specific and closely correlated with various types of CALL materials. The learning goals for defining skills are illustrated in Table 1:

Table 1. Learning goals for defining skills.

Critical Thinking	• Defining a term in an effective way • Using narrative materials to extend a definition • Considering the audience in presenting narrative materials
Reading	• Identifying a definition as you read • Using narrative materials to infer meaning
Listening & Speaking	• Taking notes of definitions as you listen • Producing an extended definition based on your notes
Writing	• Defining a concept or thing by following logical patterns • Extending a definition by using narrative materials with the audience considered
Vocabulary	• Using noun phrases in academic contexts

3.3.4. Interaction types

The CALL courseware is authored via the MOOC platform to which leaners can get easy access as long as they are connected to the internet either by computers or mobile devices. The interaction types in the courseware are illustrated in Figure 2:

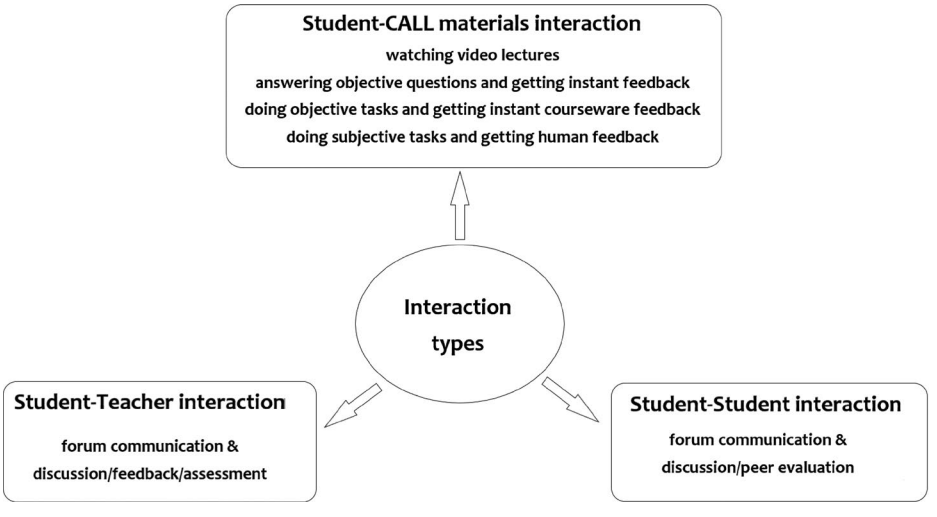


Figure 2. Interaction types in the courseware.

3.3.5. Assessment

While learning online, students can watch the mini-lectures, pausing, replaying, rewinding as needed, check and consolidate what they have learned through quizzes, post questions at any time, seek help from teachers, TAs, or peer students, discuss and share ideas and feelings on any given topic. The online learning was evaluated by assessments of various types, such as reading comprehension questions, vocabulary quizzes, writing tasks, short answer questions, and note-taking and speaking activities designed by the teaching team. Students' learning behavior and learning data were recorded automatically by the iCourse

platform, including the time they spent watching the mini-lectures, the number of mini-lectures studied, their participation in the online learning community, the results of each test and quiz, etc. Through these learning processes, students became masters of their own learning. Before meeting in class, they could learn at their own pace, anywhere and at any time. They could get fully prepared for face-to-face communicative tasks and activities in the classroom by repeated exposure to the input knowledge online (Wang et al., 2019).

Students were required to accomplish a written exercise when finishing the defining skills unit. The writing prompt goes as follows: 'Review what you have learned in this unit about definition. Write an extended definition of a term, be it a thing, a problem, a concept or a theory, in your subject of study. Write no less than 150 words'. Students were required to submit their written text on the course platform so that their peers could read and evaluate their work according to the evaluation form, shown in Table 2, provided by the CALL courseware developing team (also the teaching team of the courses). This evaluation is criteria-referenced since it targets the instructional aim of defining skills.

Table 2. Peer evaluation form for the extended definition.

Score	Description
90–100	The definition follows the pattern of a definition; uses relevant and useful narrative materials which help me understand the definition; uses academic vocabulary; is mistake free.
80–89	The definition follows the pattern of a definition; uses relevant and useful narrative materials which help me understand the definition; uses academic vocabulary. There are language mistakes in the definition.
70–79	The definition follows the pattern of a definition; uses relevant and useful narrative materials which help me understand the definition. The definition uses informal vocabulary when formal vocabulary is desirable. There are language mistakes in the definition.
60–69	The definition follows the pattern of a definition, but fails to use relevant and useful narrative materials which help me understand the definition. The definition uses informal vocabulary when formal vocabulary is desirable. There are language mistakes in the definition.
0–59	The definition does not follow the pattern of a definition and fails to use relevant and useful narrative mateirals. The definition uses informal vocabulary when formal vocabulary is desirable. There are language mistakes in the definition.

3.3.6. Questionnaire survey

To examine the participants' perceptions of their improvement in defining skills in academic contexts after instruction, we designed and conducted a questionnaire. The questionnaire was developed with reference to the instructional goals for defining skills and the survey was administered to students at the end of the unit. The survey also sought to evaluate the integration of the CALL courseware into the blended EAP instruction from students' perspective, focusing on their perception of how it might support the development of their academic skills and EAP learning. Fifteen items were included in the questionnaire, targeting

participants' perceived changes of their defining-skill related receptive language competence (reading and listening ability), their productive language competence (speaking and writing ability) and their perceived ability to evaluate definitions.

4. Results

4.1. Development of the constructive EAP CALL courseware

The EAP CALL courseware that we have developed comprises five sections for EAP learning (Critical thinking, Reading, Listening & Speaking, Writing, and Vocabulary & Structure). It makes extensive use of appropriate authentic academic discourse, including written academic texts, and spoken academic lectures. We agree with Tschirner (2001) that authentic language materials provide rich, comprehensive and flexible input that allows learners to focus on both meaning and form. In the case reported here, authentic academic discourse, along with varied skills-related tasks, through instructional design, also allow learners to focus on academic skills and functions. In addition, since learners can accomplish the learning activities in the five sections at their own pace, they can adapt the resources by selecting and sequencing the learning activities according to their specific learning needs, and engage in the cognitive processes of organizing and integrating what they have acquired in a comfortable and constructive environment.

The five sections are hyperlinked on the main page of the courseware, shown in Figure 3. They guide learners to approach a focused academic skill in the unit from the perspective of critical thinking, reading, listening and speaking, writing, and vocabulary and structure, respectively.

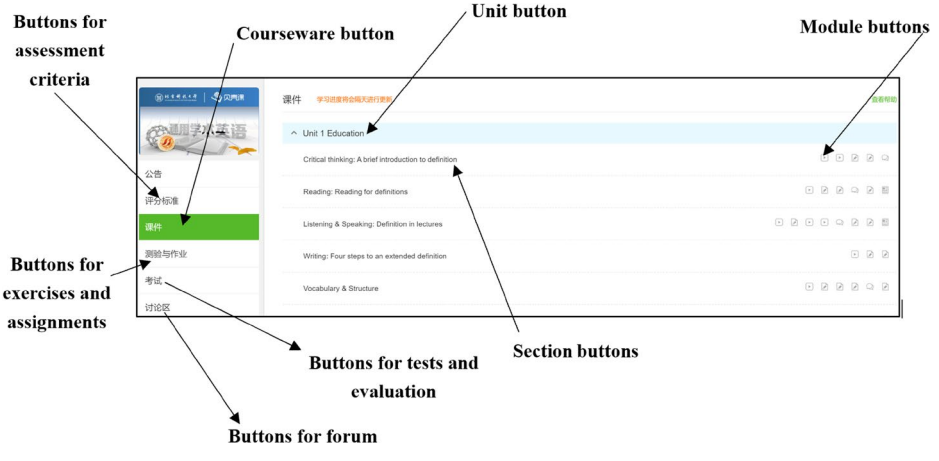


Figure 3. Section layout of the CALL courseware on the iCourse MOOC platform.

When any section button is clicked, the first module in that section will be displayed, as shown in Figure 4. Unit navigation and section navigation provide learners with a user-friendly learning environment in which they can jump from one section to another so as to adapt the courseware resources to their own learning needs. In each unit, apart from the five sections, supplementary materials were also provided in response to students' learning needs identified during the instruction and students' learning.

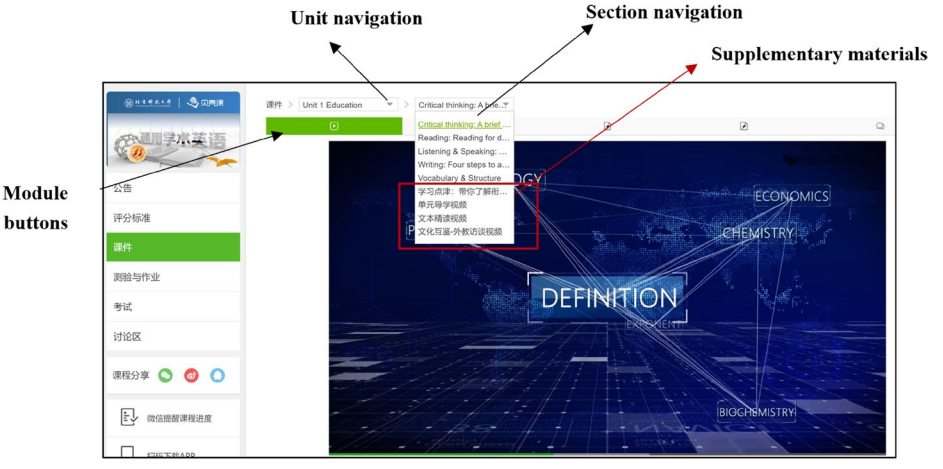


Figure 4. Screenshot of modules displayed in sections.

Within each section, resources for different modules are provided, including a video lecture module, an exercise and test module, a discussion forum module, and a peer review module. These modules form the core of the courseware, present the salient instructional purpose and highlight the 'teaching presence' (Hubbard & Siskin, 2004: 449) of the CALL courseware. Below is the description of each module.

4.1.1. The video lecture module

Utilizing the function module of presenting video resources and supporting interaction between learners and learning content, we offer five video lectures on defining skills, as illustrated in Figure 5. The instructional function of the video lecture module is to present the kernel knowledge about definition skills taking into consideration different registers within academic contexts. This corresponds to Chapelle's (1998) suggestion that courseware designers make key linguistic characteristics salient by highlighting, in this case, through video lectures.

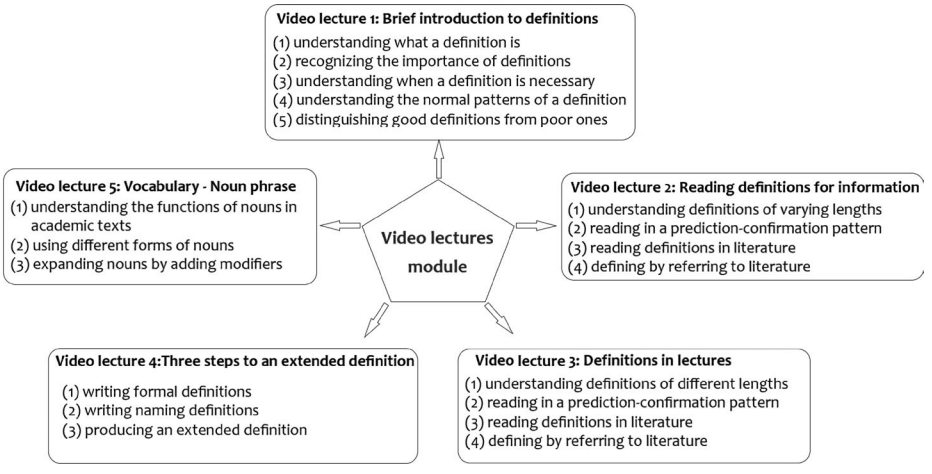


Figure 5. Illustration of five video lectures.

4.1.2. The exercise and test module

This module presents exercises and tests that help learners consolidate what they have learned from the videos and practice the relevant skills in the defining skills package. It provides instant feedback and supports self-access learning effectively. The module is also used to launch the final test for the online course.

4.1.3. The discussion forum module

This module has been used to create an online learning community. It includes such tasks as discussion, short answer questions, information sharing, exchanges of ideas, etc. The online community thereby established provides learners with a social environment for EAP learning.

4.1.4. The peer review module

This module is used to offer writing and peer review tasks. Learners are required to produce an extended definition of a term, concept, notion or theory in their own field of study. The module randomly assigns each learner six pieces of evaluation work written by their peers. Learners need to score and comment on their peers' writing according to the given evaluation criteria. And this peer review work in turn earns each learner marks as part of the 20% of the total score for the writing task, which helps motivate students to be actively engaged with the evaluation activity.

4.2. Call courseware integration into EAP instruction

The integration of the CALL courseware into EAP instruction was evaluated through assessment of the quality of students' written

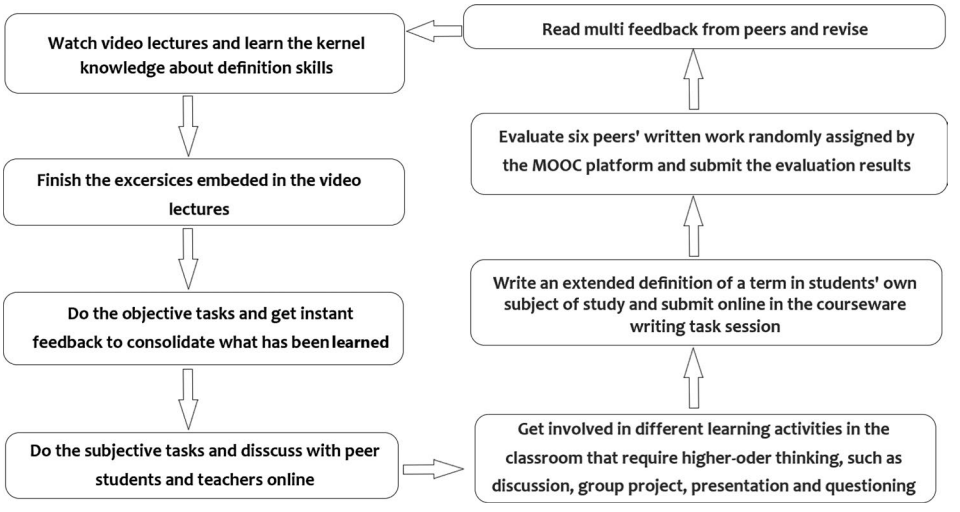


Figure 6. Activities leading to writing and peer evaluation.

definition. It is also evidenced by the questionnaire survey data about students' perception of the helpfulness of the CALL courseware in improving their defining skills for academic purposes.

4.2.1. Students' writing ability

Students were required to produce a written extended definition of a term which could be a concept or a theory in their own field of study. Figure 6 demonstrates the activities that led to the writing exercise and subsequent peer evaluation. The arrow directs back to the first step (Watch and learn), which indicates that students can refer back to any materials in the courseware.

This writing task was designed to help students apply what they had learned about definition, including patterns of definitions, narrative materials frequently used to extend a formal or naming definition, linguistic features of a definition text, and how to produce an effective and clear definition. Therefore, the quality of students' extended definition texts served as an important indicator of students' defining skills after participating in the blended EAP instruction.

The quality of the text was evaluated through a peer review mechanism provided via the MOOC platform. The full score was 100. Each student's extended definition text was designated by the MOOC platform to six student peers for evaluation based on the form provided. For instructional purposes, each student was required to evaluate six definition texts written by their peers. The underlying assumption was that if students could reasonably evaluate others' written work, they were capable of producing reasonably good written work. Since students had been trained by their teacher in the face-to-face classroom learning

session on how to evaluate a definition, they had a fairly consistent understanding of the evaluation criteria. The final score for each text was an average of the six scores marked by six peer evaluators, respectively.

Peer evaluation outcome as an indicator of students' definition writing ability was a result of both instructional consideration and a test of reliability and validity. First, multi-peer assessment is instructionally valuable. Research has revealed that multi-peer assessment can provide more feedback than an over-taxed instructor, more persuasive feedback when multiple reviewers note the same problems, and feedback representing more diverse audience perspectives (Cho & Cho, 2011; Cho & MacArthur, 2010; Liu & Hansen, 2002; Tuzi, 2004). Furthermore, in evaluating others' written definitions, students can apply the criteria for assessing the quality of the text, thereby consolidating their definition knowledge at a higher cognitive level. Second, we double checked the outcome to ensure its reliability and validity.

Using the same evaluation criteria, one of the researchers assessed each written definition text independently and gave each a score. To understand the relationship between student and teacher evaluation, a Pearson's correlation analysis was conducted between the scores from peer students and the researcher, reporting a significant correlation coefficient (r= .862, p=.000). The significant positive correlation indicates that the peer evaluation outcome was reliable and valid. The mean score (88.9) was very high, considering that most students responded negatively to the teachers when asked, before defining skills instruction, whether they knew how to produce an effective definition in English.

4.2.2. The student satisfaction questionnaire

The questionnaire was delivered electronically in the classroom instruction session at the end of the defining skills unit through a professional questionnaire platform (https://www.wjx.cn) where data can be collected and processed instantly. To avoid any ambiguities and misunderstandings, all the survey questions were in Chinese. Students were instructed to provide honest feedback. It was stated clearly at the beginning of the questionnaire and also by the teachers before the students answered the questionnaire that there were no right or wrong answers, that students only needed to select what best reflected their perceptions, and that the answers would in no way have any impact on their course grades. The retrieval rate was 100%, and all 305 answered questionnaires were deemed valid.

The data was analyzed by utilizing descriptive analysis of the mean scores. There were 15 questions in the questionnaire, all of which needed to be answered on the five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The returned questionnaires were

analyzed through SPSS. The Cronbach alpha reliability for the questionnaires was .903, indicating that the collected data was highly reliable. The results of the questionnaire are displayed in Table 3.

Table 3. Results of the student satisfaction questionnaire.

Learning objectives	Questions	Mean	SD
Knowledge objectives	1. The courseware is sufficiently helpful to improve my grasp of the patterns of definitions.	4.38	0.71
Comprehension objectives	2. The courseware is sufficiently helpful to improve my ability to identify definitions in academic ***reading***.	4.17	0.67
	3. The courseware is sufficiently helpful to improve my ability to understand definitions in academic ***reading***.	3.93	0.60
	4. The courseware is sufficiently helpful to improve my ability to identify definitions in academic ***listening***.	3.74	0.75
	5. The courseware is sufficiently helpful to improve my ability to understand definitions in academic ***listening***.	3.64	0.70
Application and analysis objectives	6. The courseware is sufficiently helpful to improve my ability to interpret information through ***reading*** definitions in academic contexts.	4.17	0.66
	7. The courseware is sufficiently helpful to improve my ability to interpret information through ***listening*** to definitions in academic contexts.	3.84	0.65
Synthesis objectives	8. The courseware is sufficiently helpful to improve my ability to produce a ***written*** definition in academic contexts.	4.13	0.76
	9. The courseware is sufficiently helpful to improve my ability to produce a definition ***orally*** in academic contexts.	3.74	0.77
Evaluation objectives	10. The courseware is sufficiently helpful to improve my ability to ***evaluate*** the quality of definitions in academic contexts.	4.27	0.68
Students' satisfaction with the CALL courseware modules	11. The ***video lectures*** in the courseware are sufficiently helpful to improve my defining skills.	4.02	0.73
	12. The ***vocabulary and structure*** materials in the courseware are sufficiently helpful to improve my ***understanding*** of academic texts.	4.13	0.73
	13. The ***interactive discussion topic*** in the forum module is sufficiently helpful to improve my defining skills.	3.57	0.82
	14. The ***learning content and activities*** in the courseware are sufficiently helpful to improve my defining skills.	4.05	0.66
	15. The ***tasks in the assignment module*** are sufficiently helpful to improve my defining skills.	3.97	0.70

The data collected from the questionnaire revealed students' positive perception of the helpfulness of the CALL courseware in improving their defining skills in academic contexts. The major findings are presented in the following sections, organized with reference to Bloom's taxonomy of cognitive learning objectives (Bloom, 1956).

4.2.2.1. Knowledge objectives. *Knowledge* is the foundational cognitive skill in Bloom's taxonomy of cognitive learning objectives and refers to the retention of specific, discrete pieces of information like facts or a sequence of events in a step-by-step process (Anderson & Krathwohl, 2001). Question 1 elicited information about students' perceptions of their improvement in

understanding definition patterns in academic contexts. The responses to this question had a mean score of 4.38, with 97.05% of the participants agreeing that 'the courseware is sufficiently helpful to improve my grasp of the patterns of definitions', and with 48.2% strongly agreeing with this view. This high mean score is consistent with the high mean score of students' written product, indicating that the coureseware is effective in improving students' defining ability.

4.2.2.2. Comprehension objectives. *Comprehension* is the next higher-level cognitive objective in Bloom's taxonomy and refers to learners' ability to comprehend the information that they encounter by explaining things in their own words, classifying items in groups, and comparing and contrasting things (Anderson & Krathwohl, 2001). *Comprehension* requires more cognitive efforts than simply remembering information, and comprehension enables students to integrate new knowledge with existing knowledge in their cognitive schemas. Questions 2 to 5 elicited information about students' perceptions of their improvement in comprehending the information delivered by definitions both written and spoken in academic contexts. The students' responses to the four questions fell into the upper intermediate scale with mean scores of 4.17, 3.93, 3.74, and 3.64, respectively. These results show higher mean scores in reading than in listening in terms of both identifying and understanding definitions, and higher mean scores in identifying definitions than in understanding them in both reading and listening.

4.2.2.3. Application and analysis objectives. *Application* and *analysis* are the third and fourth level of cognitive objectives in Bloom's taxonomy. *Application* refers to the use of knowledge, skills or techniques in new situations, and *Analysis* is the higher cognitive level where critical thinking enters and it refers to breaking down information into component parts in order to use the most important part or the most needed information (Anderson & Krathwohl, 2001). Questions 6 and 7 elicited information about students' perceptions of improvement in their application of the definition knowledge and skills and their analysis and selection of the most relevant and important pieces of information. The responses to the two questions fell into the upper intermediate scale with mean scores of 4.17, and 3.84, respectively. The results showed a higher mean score in reading than in listening. According to Wen (2013), input enables learners to produce output, and we hypothesize that the high mean scores of Questions 2 to 7 indicate the potential contribution of the input activities to the development of students' writing in terms of defining in academic contexts.

4.2.2.4. Synthesis objectives. Synthesis is the fifth level of cognitive objectives in Bloom's taxonomy and it refers to the creation of new things by utilizing

acquired knowledge and skills (Anderson & Krathwohl, 2001). Questions 8 and 9 elicited information about students' perceptions of their improvement in producing definitions in their own words both written and spoken. The responses to the two questions fell into the upper intermediate scale with mean scores of 4.13, and 3.74, respectively. The results showed a higher mean score in writing than in speaking. The high mean score of students' perception of their productive performance also correlates with the high mean scores of their actual writing performance.

4.2.2.5. Evaluation objectives. *Evaluation* is the highest level of cognitive objectives in Bloom's taxonomy and it entails the highest level of cognitive effort. In the present study, when students reflected on their peers' definition work and assessed the value of their definitions according to the peer evaluation criteria, they engaged in evaluation. Question 10 elicited information about students' perceptions of their improvement in evaluating the quality of definitions. The responses to this question fell into the upper scale with a mean score of 4.27, with 90.81% of the participants agreeing that 'the courseware is sufficiently helpful to improve my ability to evaluate the quality of definitions in academic contexts', and with 37.7% strongly agreeing with this view. This high perception score is positively related with the high mean score of students' writing performance, indicating that peer evaluation activities are desirable for improving students' writing ability. We assume that if students could reasonably evaluate others' written work, they were able to produce reasonably good written work themselves.

4.2.2.6. Students' satisfaction with the CALL courseware modules. Apart from eliciting students' perceptions of their improvement in the cognitive learning objectives of different levels, the questionnaire included five additional questions (Questions 11 to 15) targeting students' satisfaction with the instructional functions of the modules in the CALL courseware. Responses to these five questions all fell into the upper intermediate scale with mean scores of 4.02, 4.13, 3.57, 4.05, and 3.97 respectively. The results showed more positive responses to Questions 11, 12, 14, and 15 than to Question 13.

5. Discussion

This study developed constructive EAP CALL couresware for essential academic skills, using a defining skills package as an example, and integrated it into blended learning contexts where the CALL couresware played an important role in facilitating students' development of their defining skills. The courseware design was, in Colpaert's (2006) classification, pedagogy-based rather than technogolgy-based. The effectiveness

of the courseware integration has been explored in terms of students' ability in their defining skills, as indicated by the quality of their written definition work. In addition, students' satisfaction with their defining skills improvement and with the courseware integration will be further discussed. The discussion is organized into two parts: text analysis and the questionnaire survey.

5.1. Text analysis

From the peer evaluation results of students' definition work, we found that students improved markedly in their defining skills, considering their not knowing how to define academically before the instruction. The mean score was 88.9, and most of the results clustered around 80–89 and 90–100, with the highest score of 98.5 and the lowest score of 68 for only two students. This indicated that after training in the blended EAP instruction integrating the CALL courseware, overall, participants could produce a satisfying academic definition, despite occasional language mistakes.

These results indicate that the CALL courseware successfully helped students improve their defining skills and that students could comfortably use academic language to define terms in their field of study following the patterns of a definition, using appropriate narrative materials to facilitate readers' comprehension of their definitions. In other words, the instructional goal for defining skills was achieved. This adds further empirical evidence to the existing literature that language courseware designed with specific needs in mind and implemented with intensive use has the potential for eventual effectiveness (Colpaert, 2006).

In addition, the Pearson's coefficient between student and teacher evaluation of the definition text quality was significantly high (r= .862, p=.000). This suggests that the participants acquired competence at evaluating, which is a higher cognitive level objective. This is evidence that the CALL courseware integrated into the EAP blended learning situation effectively helped students develop their defining skills, especially at a higher cognitive level.

A peer evaluation of students' text quality was a quick and convenient measure of students' definition work. An empirical investigation involving experimental and control groups and a pre- and post-writing quality evaluation can be further conducted to provide more insights for the development of students' defining skills. That will offer more evidence for the effectiveness of the CALL courseware integrated into the EAP blended learning situation.

5.2. Questionnaire of student satisfaction with the CALL courseware

The high scores of satisfaction in the questionniare (see Table 3) indicate that most students were positive about the coureseware, and that they perceived the coureseware as sufficiently helpful and supportive. According to Gardner and Lambert (1972), attitudes and motivation have a strong relation to language learning outcomes. The results of the present study with students' positive attitudes and their high-quality written definition work add further evidence to this finding, which is also supported in other courseware studies (Tsai, 2009, 2010, 2015). The aim of the CALL coureseware developed in this study was to help create a blended learning context in a Chinese university. The design of the couresware therefore focused on creating a constructive EAP blended learning context which could promote ease of access and motivation for supportive learning and could help students construct knowledge and academic skills through experience. The students' overall positive reponses provide evidence that the courseware meets this end.

The highest score in answer to Q1 (the patterns of definitions) indicates that an overwhelming majority of the students (97.05%) considered the courseware sufficiently helpful in improving their grasp of the definition patterns, the fundamental knowledge of definition. This result suggests that from the students' perspective, the CALL couresware facilitated their achievement of the *Knowledge* objectives for defining skills learning, which is the lowest-level learning in Bloom's taxonomy of educational objectives. The success of the CALL courseware in knowledge transmission reveals that the courseware was effective in achieving the *Knowledge* level learning objectives. It is neccessary and desirable for instructors to transfer knowledge via the CALL courseware, which functions well in a blended instruction design with limited class hours as in college English courses in China (Wang et al., 2019).

The high scores of Q2 (reading), Q3 (reading), Q4 (listening) and Q5 (listening) provide evidence that the courseware indeed helped students improve their comprehension of the information delivered by both written and spoken definitions. These results correspond to Hubbard and Siskin's (2004) belief that tutorial CALL, particularly video lectures embedded with tasks in the CALL courseware transmitting explicit lexical, syntactical, textual and functional knowledge and skills, can help students develop receptive skills, including reading and listening. Higher scores for Q2 and Q3 than for Q4 and Q5 indicate that the courseware performed better in improving EAP reading comprehension than in EAP listening comprehension. This might be explained by students' initial competence at reading being higher than that at listening. Based

on our informal interviews with students in the classroom, most students' prior English learning experience was limited to extensive reading comprehension in a test-oriented language learning environment and there was much less listening or speaking training in their high school English programs. This was also reported in Rao's (2018) phenomenological interview study of Chinese university youth in terms of their English learning experience. To address this issue, further modification to the CALL courseware needs to focus on optimizing the materials so that the courseware can better help improve students' listening in EAP learning. Interestingly, the results show higher mean scores in identifying or locating definitions than understanding definitions in both reading and listening. From the perspective of cognitive efforts (Bloom, 1956), we hypothesize that definition understanding demands more cognitive effort than definition identification in information processing. Producing linguistic output forces learners to use what they have acquired and therefore to develop that aspect of their ability (Chapelle, 1998). Accordingly, we suggest that the CALL courseware should be adapted to provide more opportunities for students to produce output (both written and spoken) after reading.

Higher scores for Q6 (mean = 4.17) and Q7 (mean = 3.84) reveal that the CALL courseware did help students improve their defining skills at the *Application* and *Analysis* cognitive levels, providing opportunities for them to apply definition knowledge and skills, and to analyze information so as to interpret the most relevant and important information from written and spoken academic texts. The higher score for Q6 (reading) than for Q7 (listening) corresponds to students' reponses to Q2 to Q5 where students perceived more improvement in their reading than in listening. This result is further evidence of students' higher competence in reading than in listening and points to where the CALL courseware may be profitably modified in future.

The upper intermediate scale of answers to Q8 and Q9 with mean scores of 4.13 and 3.74 respectively indicates that the CALL courseware helped students produce better definitions in academic contexts by utilizing what they had acquired about defining knowledge and skills. These results support Colpaert's (2004) belief that writing, among other language skills, is suited as an instructional focus for CALL courseware which supports productive and interactive learning (i.e. definition writing and evaluation activities in the present study) with and without teacher presence. The higher score for Q8 (writing) than for Q9 (speaking) suggests that students found the courseware more helpful in improving their writing ability than their speaking ability. This also offers a helpful hint to how the courseware may be further improved: namely, more attention needs to be directed to addressing students' difficulties with spoken definitions.

The much higher score for Q10 (evaluation) indicates that students were satisfied with the CALL courseware in that it helped increase their competence in evaluating defintions. This response is consistent with the result of Q1, which indicates that students' knowledge of definition contributes to their satisfaction with the improvement in their evaluation ability and that the peer evaluation module in the courseware was pedagogically effective. This indicates that the courseware design is in line with Chapelle's suggestion that courseware should engage learners in tasks designed to maximize opportunities for good interaction (1998).

The results for Q11 to Q15 are evidence of students' overall satisfaction with the courseware modules, in particular with the vocabulary and structure materials (mean = 4.13), learning content and activities (mean = 4.05), video lectures (mean = 4.02), and tasks in the assignment module (3.95). It is worth noting that, while the score for Q15 is positive and above intermediate, it is the lowest, suggesting that students are least satisfied with the interactive discussion topic in the forum module. This points to the need for further modification of this topic.

The learning focus of the couresware was a result of a synthesis of language-centered, academic skills-centerd, content-based and task based approaches. Since CALL design is heavily context dependent (Levy, 2002), we are concerned primarily with meeting local needs, typically those related to our students and curriculum. These positive results of the questionnaire also reveal that the CALL courseware has successfully achieved its pedagogical aim.

6. Conclusion

Having considered the problems in the development and implementation of EAP courses in Chinese universities, the present research proposes as a solution the design and integration of constructive EAP CALL courseware. A case study of a defining skills package, designed for undergraduate students at USTB, is used to illustrate this solution.

The CALL courseware can be used in several scenarios. The first is a traditional multimedia equipped classroom where the courseware assists in teacher's EAP teaching. The second is a blended learning environment where EAP students learn online on a MOOC platform or other platforms and practice offline in the classroom. The third is a self-access EAP learning center where students can approach the courseware materials at their own pace or select the activities directly relevant to their own learning needs. The present study was situated in the second scenario, evaluating the effectiveness of the CALL courseware integrated into blended EAP learning instruction.

6.1. Findings

The positive results of this study reveal that the CALL courseware has achieved its pedagogical objectives and has the potential to help solve the problems identified in the development and implementation of EAP courses in Chinese universities in general. (1) The case study demonstrates the instruction of EAP from the perspectives of practitioners who prepare students for education and research through the medium of English, and provides practical evidence for further efforts in this respect. (2) It contributes to the EAP practices in Chinese universities with informed and situated academic approaches which interface language and academic practices in course design. (3) It offers feasible solutions based on the CALL courseware which is integral to a blended EAP instruction to leverage the discrepancy between the increased course load and the reduction of credits and class hours in the majority of Chinese universities.

6.2. Pedagogical implications

Based on the results of the study and the associated discussion, the following suggestions for the development and implementation of EAP courses in Chinese universities are offered.

1. CALL courseware developed in response to students' learning needs in a specific EAP situation is desirable and highly recommended for a better EAP instructional outcome. It is more feasible than ESP courses in Chinese universities where the majority of English language teachers have limited or no disciplinary backgrounds.
2. CALL courseware integrated for blended EAP learning environments can function satisfactorily in helping students improve their EAP skills and it has excellent potential to meet the challenges presented by reduced credits and class hours for English in most Chinese universities.
3. For EFL learners, such as Chinese English learners, the focus of the CALL courseware should take into full consideration both academic skills and language knowledge and skills because EFL learners need instruction not only in academic but also in linguistic skills. Therefore, a synthesis of language-centered, academic skills-centered, content-based and task-based approaches is desirable.
4. Apart from academic skills, Chinese students need more help in listening and in productive writing and speaking in EAP learning, so future design and development of CALL courseware should do more to meet this learning need.

5. Students' lowest satisfaction ratings were awarded to the interactive discussion topic in the forum module. This points to the need for more follow-up investigation into students' needs in future CALL courseware development and integration.

6.3. Limitations and future research

This study only examines students' perceptions utilizing the questionnaire method and assesses their definition writing ability through evaluating the quality of their writing assignments. Further research will be conducted to investigate whether students' positive perceptions of the CALL courseware are matched by the improvement of their learning as measured by more complex experimental research design involving control and experimental groups, pre- and post- task comparison, and using statistical instruments, and the variance in the acquired skillset for participants who strongly agreed to strongly disagreed with a perception statement. Further research should also focus on variables such as students' attitudes, confidence, motivation, and engagement. Besides, such factors as the time spent with the courseware, individual styles of interaction and learning, and content difficulty are all factors that will likely impact upon the efficacy of the courseware and these constitute areas for further investigation. Another suggested future direction could be the potential for learning transfer (Hill, Khoo, & Hsieh, 2020; James, 2014) – to what extent the students taking this course are able to transfer the specific skills acquired through the courseware to their academic practice (e.g. assignments, and thesis/dissertation writing).

Given the fact that the present study focuses on the development and integration into a blended learning environment for only one round of teaching practice, further action research and mixed methods research should be conducted in order to achieve further improvements of the CALL courseware design and integration.

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