A ‘Building material science glossary’ mobile application for Chinese international students

S N Pogorelov¹, A V Bagdueva², A O Kolmogorova¹

¹Institute of Architecture and Construction, South Ural State University, 76, Lenin Avenue, Chelyabinsk 454080, Russia
²Department of Foreign Languages, Baikal State University, 11 Lenina St, Irkutsk 664003, Russia

E-mail: pogorelovsn@susu.ru

Abstract. Chinese international students encounter a variety of difficulties in their education at Russian universities. Overcoming the language barrier and adjusting to new social and learning environment are thought to be the major factors for successful training abroad. However, there is also one serious challenge that Chinese students face. Professional disciplines, in particular technical ones, are characterized by a high concentration of terms. Knowledge of specialized technical words has a strong impact on the academic development of the students. Greater vocabulary size is a main component for understanding written learning materials and for effective oral interacting with faculty members. However, just few Chinese-speaking students demonstrate a sufficient level of competence in technical Russian. In this regard, the paper raises the issue of developing language proficiency under a course in construction. On the example of building material science the authors consider compiling a bilingual glossary designed as a mobile application. Such a ‘mobile’ glossary can help Chinese international students, whose major is construction, to successfully gain subject knowledge.

1. Introduction

In recent years, there has been an increase in Chinese international students obtaining higher education in Russia. Chinese citizens who intend to enter a Russian university should pass the Test of Russian as a Foreign Language. Successful performance at the Second Level Certificate (B2) allows its holder to receive Bachelor's degree from a Russian university, as it shows one can carry out educational activities in a chosen programme. There are also some partnership agreements between Chinese and Russian higher educational institutions which include double degree programmes and student or teacher exchanges. Under these arrangements, the competence in the Russian language is not required to be confirmed by a B2 certificate. Language skills are tested at a host institute. According to the results some students start university and other are suggested to take a one-year intensive course at a preparatory department. However, even the students who have met the Russian language requirements face difficulties during their studies. The abundance of specific terms confuses international learners. They are forced to search for translation or explanation of unknown words in dictionaries that makes a training session timeconsuming and, therefore, less effective.

The purpose of this paper is to find a way to provide Chinese international learners studying construction related subjects at Russian universities with language support. The core emphasis in the paper will be on in-session help to the students and on building an effective bridge between actors of
educational process. The paper first provides background information about Chinese undergraduate learners at South Ural State University (SUSU) and the issues the institution and the students have encountered. It then gives the aim and objectives of the research. The paper next explores the experience of instructors teaching technical subjects to Chinese students in Russia and discusses their view on the learning process and their approaches to the identified problems. Taking into account the research of our colleagues from other institutions, the authors propose developing a bilingual glossary of terms in the form of a mobile application. The paper concludes by indicating the benefits that the ‘mobile’ glossary may bring to both Chinese international students and Russian university teachers.

2. Background to the research
The Russian-Chinese Partnership Programme enables Chinese students to complete their third and final year of undergraduate studies at South Ural State University. According to the Programme the students study the Russian language for two years at their home institute and SUSU instructors come to a Chinese partner university to give a series of lectures on some specialist subjects. Thus, in fall 2018 SUSU admitted 50 Chinese students to the course in Construction and in fall 2019 there were already 78 enrolled Chinese students who chose the courses in Construction and Architectural Design. In China these students have studied all required by the academic programme general subjects and some specialist ones, such as Architecture, Building Materials and Building Structures. At SUSU, third and final year students of the Department of Construction and Architecture study only specialist disciplines.

Newcomers from China receive a considerable support from SUSU. Coordinators provide detailed information on studying, accommodation, visa and health insurance. Social meetings and outings are organised for them with the aim to reduce stress and provide emotional support. During their studies the students are involved into social, cultural, and sporting events, forums, workshops, and other activities. Most Chinese students are studious; their motivation for study is high and stable throughout their training. Nevertheless, in spite of social support and academic assistance from the university, the learners encounter challenges related to their insufficient knowledge of technical Russian. As a result, they experience significant difficulties in the subjects taken, in perception of oral lecture materials, and in classroom discussions.

This study reflects upon the growing demand for adapted for Chinese-speaking students learning materials. The aim of this paper is to develop an interdisciplinary tool that enables Chinese international students to increase their academic success at Russian construction universities. The paper rests upon relevant studies in the fields of education, material science, linguistics, and information technology. The key research objectives are to explore the learning behaviour of Chinese students, to analyse the impact of insufficient knowledge of specialist vocabulary on the training process, and to consider learning aids that enable the students to meet academic standards.

To achieve the aim and to meet the objectives, secondary data analysis and participant observation are employed as the main research methods. The paper briefly outlines key concepts and results of surveys of individual researchers. The data was collected through investigating scientific papers on Chinese culture specificities, methods of second language acquisition, online educational resources, mobile and e-learning, and current issues of teaching building material science.

3. Chinese international student issues
Most Chinese international students show limited language proficiency during their studies [1-5]. They are forced to simultaneously study subjects and specialist vocabulary. The learners spend more time on grasping course materials. Moreover, insufficient knowledge of technical Russian does not promote developing a teacher-student relationship. Russian technical universities, although rendering strong social and academic support to Chinese students, have not still found a proper way to provide them with in-session language support.

Russian pedagogical system of higher education contrasts with the Chinese one. A student-centered approach is adopted in Russia, while in China a non-communicative and team-oriented style of
teaching is used. In Russia instructors encourage students to take initiative and to develop their academic independence. In China teachers foster forming collective consciousness and neutralising egocentrism. Chinese students, due to their mentality based on Confucian values, rarely seek help from teachers, administrators, and coordinators. They almost do not voice their problems [6] fearing that this may be regarded as disrespect for the host university. However, the targeted survey demonstrates that Chinese students studying in Russia are concerned about the complexity of the curriculum and the lack of modern academic literature [7]. Russian university teachers note, in their turn, that students from China are not accustomed to a communicative approach of tuition [8] and prefer to get knowledge mainly through textbooks with further analysis of the reading [9]. In this regard, ways to integrate Russian style of academic training and Chinese methodical traditions should be found.

Teachers of Russian technical universities argue the need of modifying educational materials according to students’ knowledge of Russian. Asatryan sees a solution in using visual components and a glossary of modern terms in study guides [10]. Kazakova, Kraevskaya, and Frik say about compiling dictionaries of terms targeted at Chinese-speaking learners [11]. The authors claim that using such a dictionary enables the students to develop terminological competence and helps to arrange the concepts of the subject area studied. Pustynnicov and Shandarova consider the creation of course books on engineering disciplines in cooperation with teachers of Russian as a foreign language [12]. Shibalova and Shevchenko state that Russian textbooks on technical subjects should contain translation into Chinese [13]. The researchers tested two groups of Chinese students taking the course of Organization and Technology of the Construction of Earth Dams. The first one was provided with a handbook with a translation into Chinese, and the second group was given the same handbook but only in Russian. The experiment showed that academic achievement of the learners who used the manual with translation is twice higher (53%) than of those who used the guidebook without translation (27%).

The majority of Russian researchers stress that adapted literature is an effective way for international learners to gain knowledge in the subjects studied. Creating bilingual materials such as dictionaries, glossaries, and textbooks focuses more on accelerating the integration of the students into the field of study and less on mastering specialist vocabulary. While university teachers discuss the necessity of bilingual training materials, we consider forms that adapted literature can be developed in.

4. Developing a ‘Building Material Science Glossary’ mobile application

In the third and final year at Russian construction universities undergraduate students are trained mainly in specialist disciplines. Among them are building material science and related subjects, such as concrete science and corrosion of building materials. These disciplines are the basis for developing competencies and skills in any construction field of study [14].

Building material science requires a solid grounding in physics and chemistry [15], as the field includes physical properties and chemical composition of materials, heat treatment and thermochemical processing of raw materials. The science spans properties and behaviour of building materials and their engineering applications. By the beginning of the 21st century, there has been a qualitative change in the content of this field. This applies to an increase in, first and foremost, the range of nonmetallic materials and, secondly, empirical data on the structure and characteristics of both metals and nonmetals [16]. New discoveries and evidence have enlarged the amount of minimal information that must be obtained by students under this discipline. To help learners navigate well in a large flow of the information there have been created a fair number of e-resources. Electronic educational resources complement the main literature and enable learners to organise a quick and effective search for the relevant details [17].

Resources designed as mobile applications make it possible to individualise training and to facilitate the process of searching [18]. Learning through mobile phone applications gives students the opportunity to gain knowledge independently, to get a quick access to materials, and to improve the skills acquired during classroom sessions [19]. The complexity of the course in building material
science is multiplied for Chinese international students due to the abundance of Russian terms. In this regard, developing a ‘Building Material Science Glossary’ mobile application seems to be an appropriate learning aid. Such a ‘mobile’ glossary will be always at hand; the students can quickly find the meaning of a term in Chinese or Russian and grasp the functions of the new word.

The addressee of the ‘mobile’ glossary is Chinese undergraduate students studying at Russian construction universities. The glossary is intended for use under the course of building material science. The purpose of developing the ‘mobile’ glossary is to provide a language aid. The application compliments course books. The main tasks of the glossary are to ensure accurate translation, to provide instant access to terms, to shorten the time students spend on searching an unfamiliar word in class, and to facilitate memorising technical words. The application may ease the interaction between Russian teachers of technical disciplines and Chinese students. When the learners use the application, the teacher can determine which term is unknown to the majority of the students in the class. Having detected the word unfamiliar to the learners, the instructor can give them time to learn about the word and therefore adjust the lesson to their needs. The practical significance of the ‘mobile’ glossary is maximising the effectiveness of educational process and increasing the academic performance of Chinese international students.

5. Structure and content of the ‘mobile’ glossary
Based on the typology of dictionaries [20], this glossary is bilingual, educational, terminological, large in size of lexical minimum, electronic in design, and partially combinatorial. The principal recipients are, as it was above mentioned, Chinese international students, but the glossary is also can be used by Russians learning technical Chinese. This digital glossary contains 1,100 dictionary units taken from the Dictionary of Materials Science (Pogorelov S N, Rakitin B A, Semenyak G S, 2012, SUSU). The number of entries is due to the close and interdependent links between materials and technological factors [21]. The glossary includes not only a list of building materials, but also accompanying terms related to their properties, composition, structure, processing, and application. Being partially combinatorial means that the glossary gives one example of using a term. It illustrates how the lexical unit is used with the meaning, and it shows the word in context. The examples are selected from relevant learning materials and translated into Chinese.

The glossary is not explanatory; it features solely a translation equivalent – a corresponding word in Chinese. The grammar is presented only by parts of speech. Since words in Chinese and Russian may belong to different grammatical category, it is important to define them. This helps students to understand syntactic behaviour of an unfamiliar word.

The main page of the ‘mobile’ glossary (figure 1) includes a menu (1), an input line (2), an icon of choosing a language (3), and a list of autocompleted words (4). The interface is designed to be familiar to anyone who has ever tried using a learning mobile application. The Russian terms are presented on a blue background and the Chinese words are on a white one. The search can be both in Chinese and Russian.

From the menu users can go to the flash cards (5), create a folder with new cards (6), and start learning twenty cards selected randomly (7). A user can form a set of flash cards and name it, for example, ‘Materials’, ‘Properties’, ‘Equipment’ or ‘Lesson 1’. This option personalizes the training content. Moreover, a teacher can define a range of terms that must be learnt by the time of the next class; these words can be easily grouped into a flash card folder.

A glossary entry includes a headword in Russian (8), a word class (9), its Chinese equivalent (10), an example of using a term in Russian (11) and Chinese (12). In case if a word is searched in Chinese, the same options are available. The terms and sentences in Chinese are provided with a phonetic transcription for Russian users.

A word can be added (13) into a card folder for further repetition. A flash card contains a Russian-Chinese pair of a term (14), provides a Russian pronunciation (15) and an image (16). In accordance with the objectives set, the all entries have minimal but sufficient content for mastering a term – a translation and an example of using. A picture is put in a card for associative memorizing [22] and
excludes a different interpretation of the word, if such occurs. A user can swipe a flash card left if the word is unknown for him or her, right if the word is already memorised, or down if the term needs to be repeated.

**Figure 1.** The structure and content of the mobile application of the Russian-Chinese Learning Glossary on building materials science. (1) Menu; (2) Input line; (3) Language; (4) List of words; (5) Menu; (6) Flash cards; (7) New cards; (8) Random cards; (9) Headword in Russian; (10) Word class; (11) Example in Russian; (12) Example in Chinese; (13) Add card; (14) Pair of terms; (15) Russian pronunciation; (16) Image.

6. Conclusions and discussion
Developing the glossary as a mobile application makes it an open system that allows the creators to timely update the data by adding, changing, and deleting dictionary entries. The glossary may contribute to unification of Russian-Chinese terms and be a reliable source of professional vocabulary in the field of building material science. Such a glossary can be used in higher education and in joint Russian-Chinese construction projects. The ‘mobile’ glossary may contribute not only to improving the effectiveness of teaching Chinese students, but also to increasing the value of Russian technical education abroad in general.

The educational process at higher educational institutions has shifted to e-training in many aspects. In recent years, there has been developed a fair number of e-books, interactive books, e-learning resources, and e-learning platforms. New technologies and devices offer fresh perspectives for teaching and learning. Now it is time to consider using mobile learning applications for educational purposes. With regard to training Chinese international students, it may enhance classroom performance, help to maximize time usage, and adjust learning materials to the learners’ needs.

Since Chinese students form a large proportion of international learners in the universities not only in Russia but also in Europe and America, this kind of a bilingual glossary may be Spanish-Chinese, English-Chinese, German-Chinese and so on. The paper discusses creating a building material science mobile application, but in fact, similar applications can be developed for educational and professional use in any sphere of science and technology.

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