

University Student Core Competencies – China’s Experience

Yu-mei Wang^{1,*}, Changsong Xue² & Tonghua²

¹University of Alabama at Birmingham, United States

²Normal University, China

*Corresponding author: University of Alabama at Birmingham, United States. E-mail: yuwang@uab.edu

Received: March 12, 2021 Accepted: August 30, 2021 Published: September 24, 2021

doi:10.5296/ije.v13i3.19057 URL: <https://doi.org/10.5296/ije.v13i3.19057>

Abstract

Recent years have witnessed China’s great efforts in promoting student core competencies with the purpose of raising the quality of university graduates. To remain competitive in the global economy, the education system in China is expected to supply highly qualified and highly talented university graduates to the labor market. The present study is designed to investigate university student development of core competencies in China. The purpose of this study is to provide a basic profile of where university students are standing in the development of core competencies. Findings of the research are discussed. Information and insights gleaned through this study are helpful in developing strategies in cultivating university student core competencies to meet challenges of 21st century.

Keywords: core competencies, higher education, university students, education reform, global economy

1. Introduction

In order to function successfully as a global citizen in the 21st century, what characteristics (e.g. knowledge, abilities, and attitudes) should learners develop? The answer to this question has been the focus of education reforms in various countries. Wilson, Miles, Baker and Schoenberger (2000, p. 5) pointed out: “Every new generation of college leaders faces the same tough question: what is the common core of knowledge and skills that should be the hallmark of an educated person?”

Recent years have witnessed China’s great efforts in promoting student core competencies with the purpose of raising the quality of university graduates. As an essential player in the global economy, China faces great challenges. The population dividend in China has been the driving force in boosting its economy. Renowned as the world factory, China’s huge labor population has made enormous contribution to its rapid economic development. “First of all, while China’s economic growth miracle in the past four decades had many underlying factors, a key one was its huge labor force” (Zhou, 2018, p.1). Nevertheless, the working-age population between 15-59 in China has been shrinking since 2011. There is a fall of 3.45 million in 2012, 2.44 million in 2013, 3.71 million in 2014, and 4.87 million in 2015. It is expected that the working-age population will continue to drop at a speed of 7.6 million each year from 2030 to 2050 (Wu, 2016). To enhance its competitiveness in the global economy, China must switch its profit strategy, shifting from taking advantage of its labor dividend to talent dividend. In the past decade, China has been investing heavily in science and technology research, setting the country on its way to transform from a world factory into a global innovation hub. China makes it clear that the goal is to manufacture products invented and designed by Chinese talents. Wertime (2014) put it another way, describing that China is no longer satisfied in making iPhones. China would very much want to design and invent her own iPhones. To meet the challenge, the education system in China is expected to supply highly qualified and highly talented graduates to the labor market, which has been the focus of its education reform. “Reform in the education system should aim to accumulate overall human capital by improving the quality of education at all levels” (Cai, 2019, p.1).

2. Literature Review

The 21st century presents great challenges to university education in all countries. With rapidly globalized economy and ever-increasing international competition, the priority of university education is to cultivate students who can fit into a global society and successfully function as a global citizen. As an important player in the global economy, China is facing the urgent task on how to supply to the work force university graduates who are highly qualified, highly talented, and highly competitive. Discussing challenges presented to university education in China, Yao (2015, p. 2) commented: “It is thus a significant time for the development of the Chinese university education system and brings unprecedented challenges for preparing and managing a huge graduate population in an ever-more globalized and competitive environment. A number of core issues in university education need to be rethought: What kind of talent should be cultivated? What key competencies

should be valued? How should students be provided with the most suitable skills and competencies?”

The concept of core competencies is not new. Its definition has been evolving through time and space. The content of core competencies varies across countries and cultures. “Competencies are defined and selected with different priorities and contents, and some are regarded as more important in some countries and regions than others” (Yao, 2015, p. 24). Despite its variances in content, the importance of core competencies has been internationally acknowledged, evidenced by the commitment of countries and world organizations to developing and improving student core competencies through education reform. Core competencies is a significant quality for all individuals to develop. It helps individuals to be successful in every aspect of life. In personal life, core competencies help individuals to complete university education, be competitive in the job market, and merge into the mainstream society. Professionally, core competencies help individuals to be a contributing member to the society, promoting social and economic prosperity, democratic values, human rights, world peace, and safe ecological environments (Xin, Jiang, & Lin, 2016).

Core competencies is a multidimensional quality. It does not refer to knowledge in a single subject matter. Instead, the concept is holistic and refers to the development of a whole person. Core competencies must not be treated as an isolated entity as Priester (2017) explained: “These competencies are embedded in every discipline and area of student learning and activated throughout their daily learning experiences and activities. The core competencies are foundational and evident in every area of student learning and uniquely represented in each discipline” (p. 1).

Centering on skills for 21st century, universities in various countries and international agencies have proposed different versions of competency frameworks. An early exploration on core competencies was reported in the project “Learning Outcomes for the 21st Century (Wilson, Miles, Baker & Schoenberger, 2000). The project involved presidents from ten community colleges who convened with a two-fold purpose: (1) starting a dialogue on student learning outcomes in the community college, and (2) establishing a competency framework in a national effort to support community colleges in better defining and certifying student learning. Through discussions, the presidents reached the consensus on a set of core skills students should develop to meet challenges in the 21st century (Wilson, Miles, Baker & Schoenberger, 2000, p.15): (1) communication skills; (2) computation skills; (3) community skills; (4) critical thinking and problem solving skills; (5) information management skills; (6) interpersonal skills; (7) personal skills; (8) technology skills. Huang et al. (2018) analyzed competency frameworks proposed by major international agencies such as the United Nations Educational, Scientific and Cultural Organization (UNESCO) and Economic Cooperation and Development Organization (ECDO) as well as developed industrial countries including the United States, Japan, and Singapore. Their analysis summarized core competencies into three big categories: competency concerning knowledge (literacy, reading, communication, science, technologies, information and media technologies); competency concerning thinking and cognitive skills (creativity, problem solving, reflective and independent learner, and entrepreneurship); and competency

concerning responsibility to the society (citizenship, team player, and leadership). After reviewing numerous competency frameworks, Yao (2015, p.30) came up with six dimensions of student core competencies: (1) professional and basic knowledge; (2) creative and problem solving; (3) interpersonal communication; (4) character and civic literacy; (5) global and international perspectives; and (6) self-directed learning. These six dimensions were reflected in most competency frameworks she had reviewed.

It has been the focus of education reform in China to improve student core competencies. In 2010, the Ministry of Education (MOE) issued the *National Medium and Long-Term Education Reform and Development Plan (2010-2020)*, which states that efforts should focus on “talent development”. The Chinese government has clearly stated the necessity to intensify the support to produce university graduates with capabilities for life-long learning, innovation, and entrepreneurship. To accomplish the national goal to enhance its competitiveness in the global market, the General Office of the State Council (2015) put forward a proposal on education reform in colleges and universities. The proposal called for a full deployment of education reform focusing on cultivating student core competences. In 2016, the Ministry of Education entrusted a task force to select and define core competencies for student development in China, namely, necessary qualities and key abilities Chinese students should develop in order to meet the needs of economic and societal development in the 21st century (Lin, 2016). The task force involved 96 researchers from five universities - Beijing Normal University, South China Normal University, Henan University, Shandong Normal University, and Liaoning Normal University. The task force researched student core competencies in multiple dimensions: core competencies Chinese students should develop for the 21st century (Lin, 2016), analysis of international competency frameworks (Huang, Zhuo, & Mo, 2016), research findings on Chinese student core competencies (Liu, Hu, & Liu, 2016), impact of Chinese culture on core competencies (Zhao, Peng, Zhang, 2016), and strategies in educational reform to promote student core competencies (Jiang, Xin, & Liu, 2016). These documentations have provided guidance for the development of core competencies of Chinese students.

Currently, education reforms are widespread in China, emphasizing the urgent need for universities to turn out graduates with adequate core competencies. Nevertheless, a search through database *China Knowledge Network*, with keywords “higher education” “innovation”, “entrepreneurship”, and “core competencies” has resulted in little research on the topic by institutes in higher education of China. The research on the topic only constitutes 0.15% of the total publications. This result is extremely unsatisfactory considering the demand of the current higher education reform on developing student core competencies in the country. Further analysis shows that the existing research on student core competencies is primarily theory-oriented (Fan, 2016; Jiang, & Lin, 2016; Lin, 2016; Shi & Zhang, 2016; Xin, Zhang, 2017; Zhu, 2016). Severe lacking is empirical research on how well Chinese students are being prepared in their development of core competencies. Discussing research on student core competencies in China, Yao stated (2015, p. 38): “Comparing the rich literature on indicators of core competencies for the twenty-first century, only a few studies have considered the issues of university students’ preparedness of core competencies for the

twenty-first century. It is quite common that most of the scholars and researchers who proposed the core competencies seldom address the following question: do our university graduates have core competencies for the twenty-first century?"

The present study is designed to investigate university student development of core competencies in China. The purpose of this study is to provide a basic profile of where university students are standing in the development of core competencies. Information and insights gleaned through this study would be helpful in developing strategies in cultivating university student core competencies to meet challenges of 21st century.

3. The Study

3.1 Setting

The present study was conducted at a university in Jilin province, People's Republic of China. Jilin province is situated in the northeast of China. The University is the only provincial undergraduate institution in the southeast of Jilin and sits on the border between China and North Korea. The root of the university could be traced back to a normal school of Liaodong Province established in 1929. In 1978, the Ministry of Education approved that the school be upgraded to a university. Currently, the university enrolls more than 10,000 students and offers degrees in more than 50 disciplines.

3.2 Student Population

The student sample in the present study are undergraduates majoring in Chinese pharmaceutical medicine. Chinese pharmaceutical medicine is a discipline based on traditional Chinese medicine. The discipline covers theories, techniques, methods, and applications concerning Chinese pharmaceutical medicine, for example, new drug development and production, evaluation of safety and effectiveness of new drugs, and marketing and management of new drugs.

The reason for choosing this student sample lies in the fact that this discipline covers professional content in natural sciences as well as social sciences. This is a special group of students. There has never been any study conducted on the development of core competencies of this group of students. A total of 79 students have participated in the study. All the participants are juniors and have almost completed their university courses, ready to move into the senior year and start their internship and thesis writing.

3.3 Survey Instrument

A task force is formed to design and develop the questionnaire used in the present study. The questionnaire is aligned with the national standards for undergraduate professional qualifications in colleges and universities of China, the national standards and training goals for students of Chinese pharmaceutical medicine, and guidelines for developing core competencies of Chinese students.

The National Standard for Teaching Quality of Undergraduates in Higher Education sets the

standards for the quality of students majoring in Chinese pharmaceutical medicine. Universities should graduate students who possess: (1) adequate theory, knowledge, and skills in the field of traditional Chinese pharmaceutical medicine; (2) knowledge in humanities, social sciences, and natural sciences; (3) appropriate ideological and moral qualities; (4) professional ethics; (5) innovation and entrepreneurial awareness, (6) ability to serve society; (7) scientific methods in the field, (8) independent learning and lifelong learning abilities. The accomplishments of the above core competencies could be demonstrated through students abilities to: (1) utilize theoretical knowledge to solve real world problems in the application and production of traditional Chinese pharmaceutical medicine; (2) apply cutting-edge scientific methods and technologies to conducting research in the field; (3) use library and information resources to acquire the most updated knowledge of the field; (4) read and understand traditional Chinese medicine literature; (5) read relevant documentations in a foreign language; (6) take initiatives in innovation and entrepreneurship.

Based on the literature review and interviews of faculty members in the undergraduate programs, the task force has completed the evaluation indicators of core competencies for students majoring in Chinese pharmaceutical medicine. The questionnaire includes six parts: (1) student demographic information; (2) student basic and advanced capabilities in lab instrument operations; (3) student reading habits and skills; (4) student information sources and information search skills; (4) student knowledge in the culture of Chinese pharmaceutical medicine; (5) student knowledge on modern Chinese pharmaceutical medicine; and (6) student desire for and participation in entrepreneurship activities. The questionnaire is piloted among a small group of students. The feedback from students is collected to revise and refine the survey instrument.

3.4 Reliability and Validity of the Survey Instrument

Reliability analysis is conducted on the survey questions. The reliability coefficient α is 0.82, indicating the reliability of the survey instrument is acceptable.

The analysis shows that the common values of all questions in the survey are higher than 0.4, indicating that the data can be effectively extracted. The validity test yields KMO value as 0.734, meaning that the validity level of data is acceptable and could be used for statistical analysis.

3.5 Data Collection and Analysis

The questionnaire is sent electronically to 91 undergraduate students majoring in Chinese pharmaceutical medicine at the university. A total of 79 questionnaires is collected and deemed valid. The response rate is 86.81%. Descriptive analysis is conducted to collect baseline data on core competencies of students majoring in Chinese pharmaceutical medicine.

4. Findings

Student demographic information is presented in table 1. Female students account for 86% of the sample population. More than 90% of students are natives in Jilin Province. Nearly 75% of the students do not have an English proficiency certificate (table 1).

Table 1. Demographic Information

	Student information	number	Percent
Gender	male	11	13.9%
	female	68	86.1%
Resident	within Jilin province	74	93.7%
	outside Jilin province	5	6.3%
	no certificate	59	74.7%
English Proficiency	level four certificate	17	21.5%
	level six certificate	2	2.5%
	having passed postgraduate English exams	1	1.3%

In basic lab skills, close to 82% of students know how to record experiments in lab notebooks. However, 40% to 90% of students lack basic lab skills ranging from washing volumetric instruments to the use of UV-visible spectrophotometer. Except for their familiarity with types of general high-performance liquid chromatography (81%),

about 70% to 80% of students have not mastered other advanced lab skills and knowledge (table 2).

Table 2. Knowledge and Skills in Lab Experiments

		Number	Percent
Basic Levels	washing volumetric instruments	3	3.8%
	handling volumetric flask	10	12.7%
	utilizing acid burette and alkaline burette	47	59.5%
	washing laboratory bottles	12	15.2%
	recording correctly (including how to handle modified notes) experiments in the lab notebook	65	82.3%
	using UV-Visible Spectrophotometer	41	51.9%
Advanced Levels	building and packing column chromatography	24	30.4%
	operating high-performance liquid chromatography	16	20.3%
	recognizing types of general high-performance liquid chromatography	64	81.0%
	using gas chromatography	13	16.5%

The result shows that nearly 75% of students are in the habit of taking notes while reading (table 3). Almost 46% of students tend to forget what they have just read and need to go back to re-read the text. About 50% of students report that they are clear about the purpose before they start reading, are selective about reading materials, or combing the structure of the article and grasp main ideas of reading materials. In terms of reading sources, e-books and

e-journals (71%) are the top choice of the students. Classic literature is the least likely readings students (23%) would cover (table 4).

Table 3. Reading Habits and Skills

		Number	Percent
	taking notes	59	74.7%
	writing book reports	24	30.4%
	reading aloud	19	24.1%
	compiling excerpts	28	35.4%
Reading habits	going back to read forgotten content	36	45.6%
	Ignoring headlines and topic sentences	13	16.5%
	not paying attention to reading posture or reading hygiene	14	17.7%
	none of the above	6	7.6%
	understanding the purpose before reading	43	54.4%
	being selective in extensive and intensive reading	45	57%
Reading Skills	Analyzing the structure and grasp main ideas of the reading content	40	50.6%
	failed to master the above reading skills	12	15.2%

Table 4. Reading Source

	Number	Percent
print books and journals	55	69.6%
e-books and E journals	56	70.9%
database thesis	24	30.4%
audio and video materials	38	48.1%
classic literature	18	22.8%
web resources	54	68.4%

In searching for information (table 5), most students access China Knowledge Net (80.6%) and Baidu (75.9%). The number of students is low in using Wan Fang (41.8) and Google (32.9%%). Most students (88.6%) have never heard or used software programs in managing information. About 8% of the students have used software programs such as concept mapping to help organize information. Only 3 students (3.8%) have used such software programs on a regular basis. A significant number of students (92%) have never heard or used Noteexpress to organize research notes, bibliographies, or references.

Table 5. Skills in Searching Information

		Number	Percent
Searching Tools	cnki.net	70	88.6%
	Baidu	60	75.9%
	Wan Fan	33	41.8%
	Google	26	32.9%
Using Software (Mind maps, etc.) to help organize information	never heard of that	38	48.1%
	heard about it	32	40.5%
	have used	6	7.6%
	have frequently used	3	3.8%
Information Tool such as Noteexpress	never heard of that	26	32.9%
	heard about it	40	50.6%
	used	9	11.4%
	frequently used	4	5.1%

More than one third of students know none of the major schools of thoughts in Chinese medicine (table 6). About 46% of the students know 1 or 2 of major schools of thoughts that are widely recognized in traditional Chinese medicine. Only about 14% of students can read and understand classics on traditional Chinese medicine. More than one third of students are either unable or barely able to read classics on traditional Chinese medicine. Close to 75% of students either occasionally pay attention or do not pay attention at all to the humanistic value of Chinese medicine. About half of students know 1 or 2 websites on pharmacy management policies authorized by the nation. There are about 23% of students who report that they do not know any such websites.

Table 6. Basic Knowledge in Traditional Chinese Medicine

		Number	Percent
Listing schools of thoughts widely recognized in Chinese medicine	do not know	24	30.4%
	1 to 2	36	45.6%
	3 to 5	16	20.3%
	6 to 7	3	3.8%
Understanding classics of traditional Chinese medicine	well understand	11	13.9%
	somewhat understand	40	50.6%
	barely understand	23	29.1%
	unable to understand	5	6.3%
Paying attention to the humanistic value of Chinese medicine	pay adequate attention	20	25.3%
	occasionally pay attention	45	57.0%
	did not pay attention	14	17.7%
Knowing related website on national authoritative drug administration policy	do not know	18	22.8%
	1 to 2	45	57.0%
	3 to 4	10	12.7%
	more than 4	6	7.6%

Pharmacodynamics is the cornerstone of research on modern Chinese medicine. It is a key factor related to quality issues such as the effectiveness and safety of traditional Chinese medicine, thus a key factor for the modernization of Chinese medicine as well as its commercial development on the international arena (Wang, 2015). Most of students (90%) have heard about it (table 7). However, only about 52% of students understand its specifics. One students (1%) are currently engaged in related research work.

Table 7. Student Knowledge of Modern Chinese Medicine

		Number	Percent
pharmacodynamics (the basis of Chinese medicine efficacy and its mechanism of its activity)	never heard of it	7	8.9%
	heard it, but don't know what it means.	30	38.0%
	heard it and know the specifics	41	51.9%
	participated in related research work	1	1.3%
Secondary development of traditional Chinese medicine	never heard of that	26	32.9%
	heard it, but I don't know what it means	36	45.6%
	heard it and I know the specific meaning	15	19.0%
	participated in related research work	2	2.5%

The secondary development of traditional Chinese medicine is important part to standardize and modernize traditional Chinese medicine, which is an efficient way to drive the development of Chinese medicine industry across countries. About one third of students have never heard about the secondary development of traditional Chinese medicine. There are about 46% of students who have heard, about it but do not know what it means. There are only 19% of students who have heard and understood what it means. Two students (3%) are engaged in related research now.

Students have low participation in exploratory experiments in physics, chemistry, biology described in textbooks and teaching/learning materials (table 8). About 66% of students have never participated in exploratory experiments described in textbooks. Most students (75%) desire that they could assist instructors of Chinese pharmaceutical medicine in conducting research within the range of their capabilities in their spare time. There are only about 5% of students who have participated in innovation and entrepreneurship competitions. Most of students (74%) hope to participate in student competitions of innovation and entrepreneurship organized by colleges, provinces and the nation. However, about half of the students do not know how to get involved.

Table 8. Student Desires for and Participation in Innovation and Entrepreneurship

		Number	Percent
Participation in exploratory experiments in textbooks such as physics, chemistry, and biology	not concerned	20	25%
	concerned, did not participate	32	41%
	participated, but did not communicate with teachers and classmates in the process	13	16%
	have participated and have exchanged experiences with peers	14	18%
Use the spare time to help Chinese pharmacy teachers to engage in scientific research within their capabilities	unwilling	6	8%
	do not care	14	18%
	have desire	37	47%
	have strong desire	22	28%
Attitudes towards college students' innovation and entrepreneurship competitions organized by schools, provinces and countries	not concerned	17	22%
	willing to participate and gain experiences	22	28%
	willing to participate, but I don't know where to start	36	46%
	have already participated	4	5%

5. Discussion

Students in this study have shown inadequate development in multiple aspects of core competencies including reading and information searching skills, capabilities in lab operations, and knowledge in their professional studies. The most troubling finding of the study is that students have extremely low desire for and participation in innovation and entrepreneurship activities. The findings of the study reveal challenges higher education is facing for the development of student core competencies in China.

China has been working diligently promoting entrepreneurship education to cultivate university student capabilities in innovation and entrepreneurship. The Ministry of Education outlined the National Medium and Long-Term Education Reform and Development Plan (2010), emphasizing the importance of entrepreneurship education. In addition to high professional knowledge and expertise, university graduates are expected to have strong desire to pursue innovation and entrepreneurship. It is important to raise student awareness of value of innovation and entrepreneurship. Innovation and entrepreneurship are vital for economic growth in the country. It is also beneficial for personal development, leading to high-paying and high skilled jobs. Most universities in China are offering entrepreneurship courses. Nevertheless, the cultivation of Innovation and entrepreneurship is a complex endeavor and could not be accomplished by a single course as is the current practice in most universities in China. In the present study, more than 46% of students indicate that they do not know how to

get involved in innovation and entrepreneurship competitions. Higher education in China should be more aggressive in promoting student involvement in innovation and entrepreneurship practices. The education system needs a systematic and integrative approach to enhance student awareness, offering students learning and practice opportunities, keeping students abreast with latest information, and helping students grow and develop. We suggest a nation-wide online networked platform be established as a hub where students could access what they would like to know and learn about innovation and entrepreneurship anytime and anywhere. With the online networked platform, students could access lectures, workshops, webinars, news, government policies, funding, organizations, procedures, and cases of exemplar entrepreneurs. Students are the generation of the digital age. They would most likely welcome an online platform where they could land on magnitude of information through fingertips. In addition, discussion forums could be part of the platform where students could exchange information and experiences with peers and seek advice from professional consultants and accomplished innovators and entrepreneurs.

This study shows that students lack some of the skills they should have mastered before their entry to the university. As university students, more than half of the participants do not read with clear purposes. Students ignore the structure of reading materials and often a time, could not grasp the essence of what they are reading. These findings raise the question about the quality of education at various levels prior to university: elementary, middle, and high school. Education at each level is essential for students to lay down a solid foundation for the development of core competencies as university students. Strong reading skills is the basis for student learning of other subject matters and a prerequisite for students to be reflective life-long learners. However, it is difficult to implement quality education due to pressures from China's high school and college entrance examination. To ensure student success in entrance exams, teachers teach to the test and students turn to be test wizards. The other finding from this study also points to this issue. Students lack basic lab skills. Chinese students are well known to be poor in hands-on capabilities. They mainly learn sciences through textbooks and seldom get involved in hands-on lab experiments. They might be good with remembering theories and could score high in tests. However, they lack problem solving skills and have difficulties in handling complex real-world problems, not to speak of creativity and innovation. "The Chinese education system still emphasizes rote learning over creativity, raising legitimate questions over how many future Jobs, Gates, and Zuckerbergs populate its ranks" (Wertime, 2014, p.1). To implement quality education at all levels, the enrolling system must be reformed on assessing student qualifications to enter high schools and universities. The quality of students must be evaluated in multiple dimensions, centering on student core competencies. The enrolling system is the root problem prohibiting full deployment of education reform. It is beyond the scope of this paper to discuss the issue of entrance exams in-depth. Currently, there are national efforts to reform the enrolling system, calling for a balanced approach to assess the qualities of students for admission to universities. According to China Daily: "The reform aims to make the selection of students and their enrollment in universities a more scientific and fair procedure and promote education for students' all-around development "(2019, p.1). We must fully aware that education reforms cannot circumvent the enrolling system. With the enrolling system intact, any education

reform would only have limited impact on the quality of education.

This study points to the need to revise and refine current curriculum following the framework of student core competencies in the discipline of Chinese pharmaceutical medicine. Current curriculum needs to emphasize the value of culture in traditional Chinese medicine. Classical works in traditional Chinese medicine is the foundation of the field and a pathway to learn Chinese medicine. To be accomplished in the field, one must have a good command of classical works in Chinese medicine. However, most of students in this study could not read and understand classical works in traditional Chinese medicine. Many universities are currently offering compressed versions of curriculum in Chinese pharmaceutical medicine, neglecting the necessity for students to study and research classics in traditional Chinese medicine. Classics in traditional Chinese medicine should be an integral component in the curriculum - It could be a reading assignment, a project, or a discussion theme in courses. Elective courses could be offered to guide students in conducting extensive and intensive readings of classical literature in traditional Chinese medicine.

Further, the curriculum should introduce students to the current development in the field including latest research, trend, and market demand. In this study, students lack understanding of the secondary development of Chinese medicines. Secondary development is a big thing in the field of Chinese medicine. Its purpose is to promote the transformation of Chinese medicine into a technology-based and cost-effective industry. The process focuses on analysis of clinical advantage, pharmaceutical process, and drug risks to raise its market competitiveness, re-innovate Chinese patent medicine products, and accelerate the cultivation of well-known Chinese patent medicine products. It is important that curriculum in Chinese medicine exposes students to the latest news in the field, which will increase opportunities for students to get involved in cutting-edge research and benefit their career development. One effective way to bring the latest news of the field to the course is to get students involved. Students could form news groups, searching for news and reporting news to the class. The instructor could allocate 5-10 minutes of class time before his/her teaching for news report. A class bulletin board could be established for students to post, compile, and follow up news on research and development in the field of Chinese medicine.

6. Conclusion

This study provides evidence-based data on core competencies of Chinese university students. It is the first study focusing on a group of students who are majoring in Chinese pharmaceutical medicine – a discipline covering both natural science and social science subjects. Although this study is conducted on a small scale, which limits the generalization of its findings, the initial insights gained through this study could be of help in the improvement of core competencies of students with science, technology and liberal arts majors. This study is significant in that it has designed and implemented a survey instrument which is feasible and replicable in future studies investigating core competencies of students majoring in Chinese medicine. Education reform is heating up across the country. Research on student core competencies is informative and directive in implementing education reforms. Empirical

research provides evidence-based data for curriculum redesign and policy development. Future research could be conducted on larger scales, with students of different academic status (freshman, sophomore, junior, and senior), and in various dimensions of student core competencies. The future of our society hinges on how well prepared our students are. The development of student core competencies is worthy of our ultimate efforts.

Acknowledgement

This study is sponsored by Jilin province education and science grant (GH170568).

References

- Cai, F. (2019). Population dividend is diminishing after 40 years. *Global Research*. Retrieved from <https://www.globalresearch.ca/china-from-population-dividend-to-reform-dividend/5672352>
- Fan, L. M. (2016). Student core competencies in innovation and entrepreneurship: theoretical research and practical exploration—Taking Shanghai University of Finance and Economics as an example. *China Higher Education Research*, 10, 83-87.
- Huang, S., Zuo H., Mo, L., Liu X., Xin T., & Lin C. D. (2016). An international analysis of the research on the development of student core competencies. *China Education*, 6, 8-14.
- Jiang, Y., Xin T., Liu, X., & Lin, C. D. (2016). Paths and strategies of education reform and practice based on student core competencies. *China Education*, 6, 29-32.
- General Office of the State Council (2015). Opinions on Deepening Education Reform in Higher Education Concerning the implementation of innovation and entrepreneurship Education. Retrieved from http://www.gov.cn/zhengce/content/2015-05/13/content_9740.htm
- Lin Chong De. (2016). Development of student core competencies: What kind of people should be cultivated for the future? *Journal of China Education*, 6(1), 1-2.
- Liu, X., Hu, Q. F., Liu, Y., Fang, X. Y., Chen, Y. H., Mo, L., & Lin, C.D. (2016). An empirical investigation of the development of Chinese student core competencies. *Journal of China Education*, 6, 15-22.
- Ministry of Education (MOE) (2010). Outline of China's National plan for medium and long-term education reform and development 2010-2020. Retrieved from <https://planipolis.iiep.unesco.org/en/2010/outline-chinas-national-plan-medium-and-long-term-education-reform-and-development-2010-2020>
- Priester, D. (2017). Middle School Core Competencies. Retrieved from

<https://www.midpac.edu/blogs/dpriester/2017/11/middle-school-core-competencies.php>

- Shi, O., & Zhang, W. (2016). The cultivation of student core competencies: calls for textbooks. *Courses, Textbooks, and Teachings*, 9, 4-19.
- Wertime, D. (2014). It's official: China is becoming a new innovation powerhouse. *Foreign Policy*. Retrieved from <https://foreignpolicy.com/2014/02/07/its-official-china-is-becoming-a-new-innovation-p-overhouse/>
- Wilson, C. D., Miles, C. L., Baker, R. L., & Schoenberger, R. L. (2000). *Learning Outcomes for the 21st Century: Report of a Community College Study*.
- Winterton, J. (2009). Competence across Europe: highest common factor or lowest common denominator? *European Industrial Training*, 33(8/9), 681-700. <https://doi.org/10.1108/03090590910993571>
- Xin T., Jiang Y., Lin C. D., & Liu, X. (2016). On the connotative characteristics and framework positioning of the core competencies of student development. *China Education*, (6), 3-7.
- Wang X. J. (2015). Systematic Methodology of Basic Research on the Pharmacodynamics of Traditional Chinese Medicine—Medicine Metabolomics of Traditional Chinese Medicine. *Traditional Chinese Medicine*, 1, 13-17.
- Wu, Y. (2016). China's labor market: Shrinking workforce, rising wages. *China Daily*.
- Yao, J. J. (2015). *Core competencies for the twenty-first century university education: An investigation into students' perceptions in two Chinese societies*. (Doctoral Thesis, Hong Kong Institute of Education, Hong Kong)
- Zhang M. L. (2017). Research and practice of innovation and entrepreneurship education based on core qualities of higher vocational students. *China Training*, (11), 53-55.
- Zhao, J. X., Peng, Y. G., & Zhang W. X. (2016). Research on inheritance of Chinese excellent traditional culture and development of student core competencies. *China Education*, 6, 23-28.
- Zhou, M., & Xu, H. (2012). A review of entrepreneurship education for college students in China. *Administrative Sciences*, 2(1), 82-98. <https://doi.org/10.3390/admsci2010082>
- Zhu, L. M. (2016). Construction of student mathematics core competencies in curriculum reform. *China Education*, 5, 76-80.
- Zhou, X. (2018, January 28). Why China must wake up to demographic reality. *South China Morning Post*, 1. Retrieved from <https://www.scmp.com/news/china/economy/article/2130737/why-china-must-wake-demographic-reality>
- College entrance exam reform extends to more provinces (2019, March 2). *China Daily*.

Retrieved from
<http://www.chinadaily.com.cn/a/201903/02/WS5c79e4fba3106c65c34ec50c.html>

Copyright Disclaimer

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/3.0/>).