New Demands on College Teachers' Teaching Competencies: Evidence from Teacher Education Revitalization Policies of China

Bingbing Zhong
Faculty of Education, University of Malaya, Malaysia
bingbingzhongaizhihui@gmail.com

Dorothy DeWitt
Faculty of Education, University of Malaya, Malaysia
dorothy@um.edu.my

Shuxian Zheng
Faculty of Education, University of Malaya, Malaysia
Universiti Malaya
zhengshuxian@bdu.edu.cn

Mingfang Zhang
Faculty of Education, Jiangxi Normal University, China
zmf303@163.com

ABSTRACT

This article examines new demands on college teachers' teaching competencies by reviewing Teacher Education Revitalization policies in China, for existing research on teaching competency of college teachers is very rare. In terms of methodology, it uses content analysis on primary sources related to Action Plan for Teacher Education Revitalization (2018-2022) and Implementation of Excellent Teacher Training Plan 2.0. With the application of natural language processing in text summarization extraction, Teacher Education Revitalization policies were analyzed based on TF-IDF algorithm via Python programming. As findings, internal logic and new demands of Teacher Education Revitalization policies highlighted that teachers' college and pre-service teacher are linked by teachers' teaching competencies. Specifically, college teachers should implement teacher morality education, integrate theoretical teaching and practical teaching, and pay attention to the application of information technology in educational environment. As implication, this study developed a Teacher Education Revitalization policy framework, which can be supportive for future researchers and front-line practitioners interested in teacher education policy text analysis and teachers' teaching competency development.

Keywords: Policy framework, Teacher Education Revitalization, teaching competency, TF-IDF algorithm

INTRODUCTION

On February 11, 2018, the policy referred to the Action Plan of Teacher Education Revitalization (APTER) (2018-2022) (MOE, 2018a) which aims at promoting the development of teacher education reform, was promulgated by the Ministry of Education in China. Compared with the previous Free Education Policy for Pre-service Teacher (MOE, 2007), APTER made several explicit adjustments: the changes from free education pre-service teacher to government-paid pre-service teacher, the service period for pre-service teachers from 10 years to 6 years (MOE, 2018d), and more importantly, taking different measures to attract excellent students to be teachers, such as comprehensive promotion of teacher morality education, advancement of teacher training level, quality improvement of pre-service teacher, innovation of "internet + teacher education", construction of high-level teacher education base, optimizing the teaching staff of teacher education, and construction of teacher education quality assurance system (MOE, 2018a).

Since APTER was issued, it has become a new research trend in China. There have been many achievements in the research of teacher competency (e.g., Yu & Lu, 2021; Wang et al., 2021; Bo & Wang, 2020; Huang, 2020), but the results specializing in teaching competency of college teachers are very rare (He, 2014; Hao, 2015), because revitalizing teacher education is still at the early stage (Rao, 2020). There is a need to reveal teaching competencies for college teachers, especially with the new demands of Teacher Education Revitalization. Therefore, the aim of this study is to figure out new demands for college teachers' teaching competencies by reviewing relevant Teacher Education Revitalization policies in China. And this study will be guided by the following research questions:

1. What is the internal logic of Teacher Education Revitalization policies?

2. What kind of new teaching competencies are required for college teachers by the internal logic of relevant policies?

METHODOLOGY

This study is a document study using content analysis on relevant Teacher Education Revitalization policies in China since 2018. More specifically, natural language processing (NLP), which is a field of computer science, artificial intelligence, and computational linguistics (Christian et al., 2016), will be used for text summarization extraction (Al-Hashemi, 2010; Kulkarni & Apte, 2013). Text summarization extraction is the process of providing important information by compressing one or more texts. Referring to the detailed algorithm, Term Frequency-Inverse Document Frequency (TF-IDF), reflecting the importance of a word in text, could efficiently and accurately extract text summarization from relevant documents. By convention, the TF-IDF value increases proportionally to the number of times that a word appears in a document, but is offset by the frequency of the word in the corpus, which helps to control the fact that some words are more common than others (Salton & Buckley, 1988). When conducting TF-IDF algorithm, the first step is to preprocess with tokenization, part-of speech tagger, stopwords, and stemming (Bird et al., 2009; Petrov et al., 2011); then, TF-IDF value ranging from zero to one can be calculated by the equation of TF-IDF in the processes of feature extraction and summarization.

Resources and Procedures

In this study, Action Plan for Teacher Education Revitalization (APTER) (2018-2022) and Implementation of Excellent Teacher Training Plan 2.0 (IETTP 2.0) will be selected as the data sources for text summarization extraction. APTER is the milestone of Teacher Education Revitalization and IETTP 2.0 is the complementary policy of APTER, both of which are from broader aspects to promote Teacher Education Revitalization. As to IETTP 2.0, it also requires to significantly enhance the pertinence and effectiveness of teacher morality education, update the course system and teaching content, basically reshape a new form of education and teaching centered on pre-service teacher, significantly improve the quality of practical teaching, basically construct collaborative training mechanism, and obviously optimize the teacher education team (MOE, 2018c). Hence, the internal logic of Teacher Education Revitalization can be holistically revealed within IETTP 2.0. However, thematic policy, such as Educational Informatization 2.0 Action Plan (MOE, 2018b), which mainly centers on the application of information technology on education environment, is excluded for text summarization extraction because this kind of policy cannot reveal the holistic internal logic of Teacher Education Revitalization policy.

This study will firstly extract top words from the APTER and IETTP 2.0; then, discover the internal logic of Teacher Education Revitalization policies based on the Teacher Education Revitalization policy framework developed by these extraction results; finally, unveil new teaching competencies for college teachers by the internal logic of relevant policies.

FINDINGS

With the application of TF-IDF algorithm in text summarization extraction, 20 top words (Table 1), mainly reflecting Teacher Education Revitalization policy issues, were extracted from APTER and IETTP 2.0 by Python programming tool. The text summarization extraction results by descending sequence of TF-IDF value as follows: teacher, education, pre-service teacher, teaching, course, primary and secondary school, teacher morality, teachers' majors, educational practice, construction, teachers' college, support, implementation, rural area, quality, Master of Education student, subjects, collaboration, kindergarten, and secondary vocational school. However, only looking at the Teacher Education Revitalization policy from the content presented by the extraction results, there are still certain limitations and considerable errors. Therefore, the next section will explore the relationships among these words through developing possible policy framework, and unveil the Teacher Education Revitalization policy internal logic based upon the policy framework.

Table 1

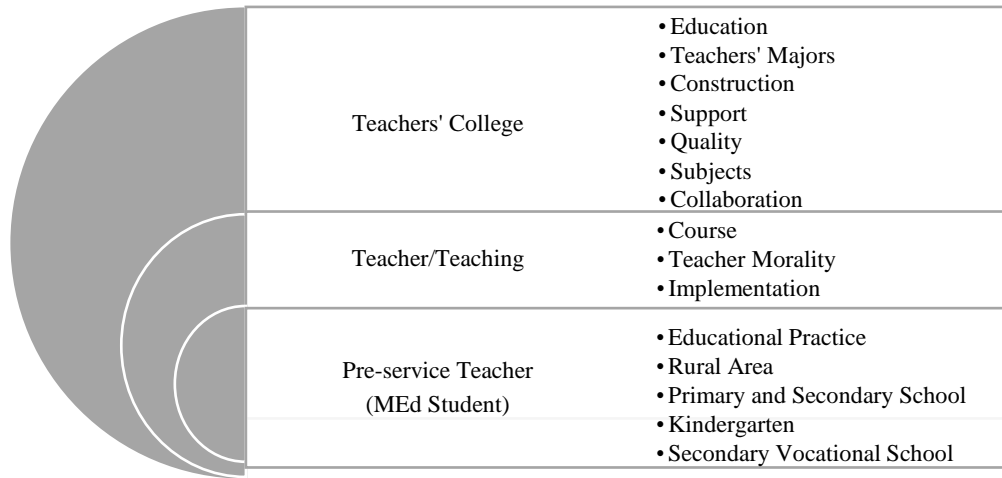*Top Words Extraction Results by Descending Sequence*

Sequence	Top Words	TF-IDF Value
1	Teacher	0.521470906533552
2	Education	0.3312559011732482
3	Pre-service Teacher	0.18233543347462894
4	Teaching	0.08944998038061788
5	Course	0.07798628404947187
6	Primary and Secondary School	0.06953998073724887
7	Teacher Morality	0.06461001042447359
8	Teachers' Majors	0.06199578814774595
9	Educational Practice	0.05975314910551606
10	Construction	0.057654251036700035
11	Teachers' College	0.047983008809112875
12	Support	0.04556533388756645
13	Implementation	0.04094259249323093
14	Rural Area	0.03916388636950294
15	Quality	0.038007006124929237
16	MEd Student	0.036742449695188126
17	Subjects	0.03014781913053849
18	Collaboration	0.027442302724853297
19	Kindergarten	0.02672462636136348
20	Secondary Vocational School	0.026119242799516742

The Internal Logic of Teacher Education Revitalization Policies

These 20 top words were collapsed into the Teacher Education Revitalization policy framework (Figure 1) by three different categories to strengthen the stakeholders and their nested relationships. As revealed that research can be focused on any domain related to the context (Martin et al., 2020), the pre-service teacher (MEd student) section associated with teacher and teaching domain contains educational practice, rural area, primary and secondary school, kindergarten, and secondary vocational school; the teacher and teaching area interacted with teachers' college domain includes course, teacher morality and implementation; and the teachers' college part (education, teachers' majors, construction, support, quality, subjects and collaboration) captures broader context reflecting the influences on teacher and teaching domain and pre-service teacher domain. Due to the nested relationship existed in the Teacher Education Revitalization policy framework, what needs to be pointed out is that the themes of the three dimensions can be intersected. For example, the broader collaboration of teachers' college could be explored through the collaboration of teachers' college and secondary vocational school, and the collaboration of college teachers' teaching and pre-service teacher educational practice. The subject categories of teachers' college will influence the course design of college teachers' teaching and educational practice of pre-service teacher. Additionally, teacher morality can be relevant to college teachers as well as pre-service teachers.

Figure 1

Teacher Education Revitalization Policy Framework

Teachers' College	• Education • Teachers' Majors • Construction • Support • Quality • Subjects • Collaboration
Teacher/Teaching	• Course • Teacher Morality • Implementation
Pre-service Teacher (MEd Student)	• Educational Practice • Rural Area • Primary and Secondary School • Kindergarten • Secondary Vocational School

Based upon the nested relationships in the Teacher Education Revitalization policy framework, this study discovered the internal logic of Teacher Education Revitalization policies: teachers' college and pre-service teacher are mainly linked by college teachers, particularly by their teaching (Figure 2). That is, targets and measures of teachers' college, and pre-service teachers' (MEd students') professional development mutually interact within college teachers' teaching.

Figure 2

Teacher Education Revitalization Policy Internal Logic
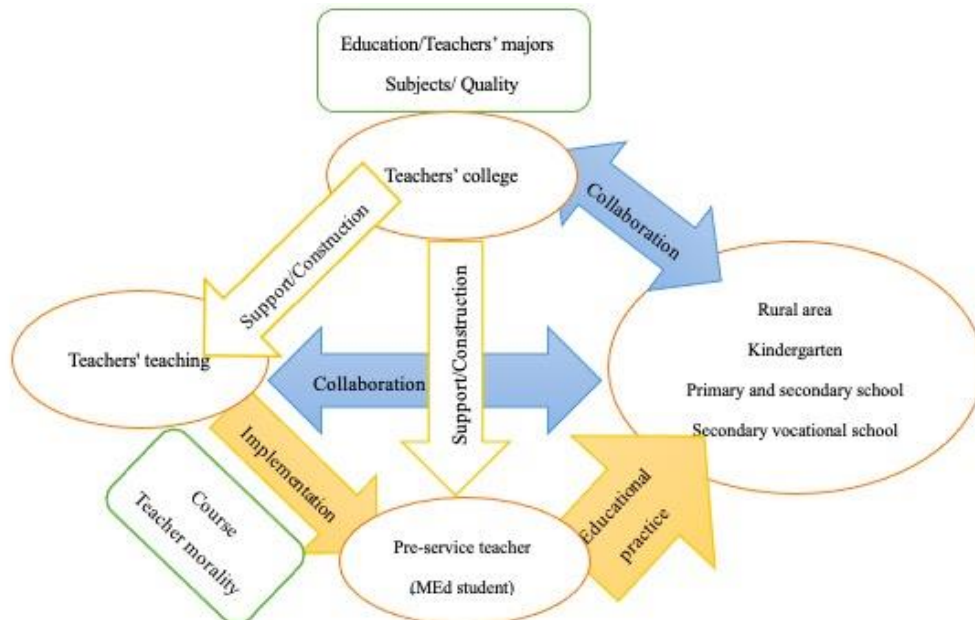
New Demands on College Teachers' Teaching Competencies

The explanations for the internal logic of Teacher Education Revitalization policies are that college teachers' teaching plays a critical role in the context of Teacher Education Revitalization and there are new demands on college teachers' teaching. Specifically, to meet the new requirements and effectiveness of teacher morality education, college teachers should implement teacher morality education with core socialist values throughout the whole process of teacher education. Additionally, college teachers should integrate theoretical teaching and practical teaching through the practice-oriented course design and teaching method, because the policy internal logic strengthens the collaboration of course implementation and educational practice. Thirdly, it is very imperative to point out that college teachers should also pay attention to the application of information technology in educational environment (MOE, 2018a, 2018c) due to the policy structural context of technological developments (Jie, 2016), though information-based teaching is not one of the 20 top words because of the validity of TF-IDF algorithm (Christian et al., 2016).

Since these three aspects, the implementation of teacher morality education, integration of theoretical teaching and practical teaching, and information-based teaching, reflect the new requirements and challenges of college teachers' teaching under the background of Teacher Education Revitalization. What's more, they also become new demands on college teachers' teaching competencies. Therefore, in order to meet these new demands, college teachers' teaching competencies could be developed from the above mentioned three aspects.

DISCUSSION

This section will discuss how college teachers' teaching competencies possibly meet new demands within college teachers own perspectives: cultivating and practicing core socialist values to construct teacher morality, in-depth integration of theoretical teaching and practical teaching, and all-round development of information-based teaching level, by referencing relevant literature and the Teacher Education Revitalization context in China.

Cultivating and Practicing Core Socialist Values to Construct Teacher Morality

College teachers should strengthen their own teacher morality construction to promote teacher morality education (MOE, 2018a, 2018c). However, teacher morality construction for college teachers themselves encounters challenges and impacts of the complex environment at home and abroad in the new era. Therefore, it is urgently needed for college teachers to actively cultivate and practice core socialist values (MOE, 2018a, 2018c), and use core socialist values as the spiritual pillar and action guide for constructing teacher morality.

First, teachers' college should improve the coverage and influence of core socialist values in the field of education to dispel the anxiety derived from multiple value orientations and eliminate the raging of utilitarianism on teacher morality construction. Specifically, teachers' college should promote teacher morality development (Ye & Law, 2019) for college teachers in the process of professional development, by integrating core socialist values education with prominent themes, diverse forms, and rich content into the stages of pre-job training, and post-service education; in addition, management departments, such as the Personnel Office of the teachers' college, incorporate core socialist values into all aspects of the faculty team construction, including teacher recruitments and incentives. In this way, in the process of constructing faculty team, teachers' college will improve and perfect the teacher morality

system, and then rely on the teacher morality system to further promote the teacher morality construction of college teachers. Therefore, it is very necessary for teachers' college to make full use of teacher professional development and construction of faculty team to cultivate the core socialist values of college teachers. Besides that, the collective wisdom of teachers' college and college teachers themselves should jointly promote the construction of teacher morality, so that teacher professional identity (Yao et al., 2020) can meet the standards by new demands on teacher morality education (Li, 2021; Yang et al., 2020).

Second, college teachers themselves should practice core socialist values to find a spiritual world that responds to the atrophy of teacher morality. They should fully understand these difficulties such as the choice of the subject's interests, and the tangled reality of the practice object (Qiu & Zhou, 2017). In this case, college teachers, as the educational practitioners, can properly handle various teaching relationships because of their own professional identity and social responsibility; and as the unity of means and purpose, college teachers can accurately grasp the educational yardstick (Li, 2012) because of rationally practicing core socialist values. As a result, practicing core socialist values can provide the "Chinese Road" and "Chinese Model" under the "Chinese Reference System" for the formation and application of educational yardstick, and better highlight the teacher morality construction and teacher morality education of "Chinese consciousness".

In-depth Integration of Theoretical Teaching and Practical Teaching

Is it possible for college teachers to deeply integrate theoretical teaching and practical teaching? Li (2018) proposed that theory and practice are mutually founded, needed, and logical, which provides possibilities for the integration of theoretical teaching and practical teaching. And the realization of integration needs to break original teaching cognitive model and reexamine the possibilities related to the unity of theoretical teaching and practical teaching; simultaneously, it also requires college teachers to handle the relationship between theoretical teaching attitude and practical teaching status, so as to establish the teaching concept of integration of theoretical teaching and practical teaching, and update the educational philosophy for the implementation of theoretical teaching and practical teaching.

How is it possible for college teachers to integrate theoretical teaching and practical teaching? The college teachers' teaching reform towards the unity of theoretical teaching and practical teaching are the necessary condition for this integration to reach the state of mutualism.

First, college teachers should actively promote the improvement of the pre-service teacher training program. The training program must answer "what kind of pre-service teachers are cultivated" and "how to cultivate pre-service teachers through course design and teaching reform". As to the former one, college teachers should understand the employment base underpinned by Teacher Education Revitalization policy structure context (Jie, 2016) to balance the development of pre-service teachers' teaching theory and teaching practice, and then use the employment base as the latter's baton to rationally improve the course design and teaching mode. In this way, the in-depth combination of theoretical courses and practical courses breaks the traditional split teaching mode of theoretical teaching and practical teaching.

Second, college teachers should strengthen the collaboration with teaching practice base (e.g., kindergarten, primary and secondary school, and secondary vocational school) for pre-service teachers, particularly the collaboration in rural area to meet the needs of Rural education

revitalization (State Council of the People's Republic of China, 2018). For example, in the construction of the "dual tutor system" training model for pre-service teachers, Jiang and Li (2013) put forward the training design philosophy of "teaching collaboration of teachers inside and outside the college". Based upon this training design philosophy, college teachers' teaching mainly centers on pre-service teachers' basic teaching skills and theoretical teaching foundation; the teaching of off-campus teachers focuses more on pre-service teachers' follow-up internship and practical teaching; and the "dual tutor system" pays attention to pre-service teacher education such as deepening teacher morality education, developing practice-oriented course design and teaching method, and establishing teaching evaluation mechanism, through teaching and research activities or academic conferences. Thus, the combination of theoretical teaching and practical teaching can be achieved through the improvement of collaborative training mechanism.

All-round Development of Information-based Teaching Level

According to the Educational Informatization 2.0 Action Plan policy, it is necessary to improve college teachers' information literacy, promote college teachers to actively adapt to new technological innovations such as informatization and artificial intelligence, and effectively support college teachers' teaching (MOE, 2018b). However, in the context of Educational Informatization, the current status of college teachers' information-based teaching level, which is still in the primary stage, is required to be fully developed.

Firstly, college teachers should enhance the recognition of information-based teaching to deepen information-based teaching philosophy. (a) Comprehending the concept of information-based teaching (Sang & Dong, 2016; Huang, 2018). The information-based teaching refers to the use of modern information technology in the teaching process. Compared with traditional education, it has significant characteristics such as multimedia teaching materials, globalization of resources, individualized teaching, learning autonomy, management automation, and environment virtualization (Pei, 2012). (b) Grasping the information-based teaching philosophy to establish a new perspective on teachers, students and courses. College teachers are the designers, facilitators, and innovators of information-based teaching. They apply information technologies into course design and teaching method to promote teaching implementation and pre-service teachers' learning. Pre-service teachers are learners, participants, and evaluators of information-based teaching. Student-centered information-based teaching should pay attention to the differences, participation, and evaluation of pre-service teacher. In the Educational Informatization context, course content, presenting the characteristics of easy updating, sharing, and relevance, requires information-based teaching to be more diversified, open, and logical.

Additionally, college teachers should strengthen information technology learning to promote the transformation of information technology in their teaching process. (a) College teachers can consolidate the foundation of information-based teaching by participating in information technology training, pertaining to information retrieval and collection, information processing and analysis, information exchange and evaluation, information creation, and information security and ethics (Jiao & Wen, 2016). (b) Under the guidance of the integration of "information technology + subject teaching", the transformation of information technology in the teaching process needs the autonomy of college teachers to think deeply about the

characteristics of the subject, the characteristics of pre-service teachers' learning, and the possibilities and approaches relevant to this integration.

Lastly, college teachers should advance the application of information technology to drive innovation of information-based teaching (Yang et al., 2018; Fan & Li, 2020). (a) The application of information technology drives the reconstruction of course design. For example, college teachers utilize information technology to collect, analyze, and mine pre-service teachers' course satisfaction data, and then evaluate whether the course content is diversified, open, and logical according to the data analysis report. In this situation, college teachers could dynamically track the effectiveness of course design, so as to continuously update course content for innovation of information-based teaching. (b) The application of information technology drives innovation of teaching mode. For example, applying "Internet + pre-service teacher education" into college teachers' teaching (Xie, 2017), they could make good use of multimedia teaching mode, the MOOC-based flipped classroom teaching mode, the remote live teaching mode, and the virtual reality docking teaching mode based on collaboration of cloud computing service and virtual reality technology.

CONCLUSION

The aim of this study is to figure out new demands on college teachers' teaching competencies through analyzing two Teacher Education Revitalization policies of China since 2018. Content analysis method was used in the data analysis process. With the application of NLP in text summarization extraction, APTER and IETTP 2.0 were analyzed based on TF-IDF algorithm via Python programming. 20 top words were extracted relying on the TF-IDF value of word, and then these extracted results were collapsed into the Teacher Education Revitalization policy framework by three different categories: teachers' college domain (education, teachers' majors, construction, support, quality, subjects and collaboration), teacher/teaching domain (course, teacher morality and implementation), and pre-service teacher domain (educational practice, rural area, primary and secondary school, kindergarten and secondary vocational school). Based upon the Teacher Education Revitalization policy framework, this article discovered its internal logic that teachers' college and pre-service teacher are linked by teachers, especially by their teaching. That is, targets and measures of teachers' college and pre-service teacher professional development mutually interact within college teachers' teaching. Specifically, college teachers should implement teacher morality education throughout the whole process of teacher education, integrate theoretical teaching and practical teaching through the practice-oriented course design and teaching method, and pay attention to the application of information technology in educational environment. What more, these three aspects also become new demands on college teachers' teaching competencies. Therefore, in order to meet these new demands of Teacher Education Revitalization, college teachers' teaching competencies could be developed from the above mentioned three aspects: cultivating and practicing core socialist values to construct teacher morality, in-depth integration of theoretical teaching and practical teaching, and all-round development of information-based teaching level.

Limitations of the study lie in the text summarization extraction. The validity of the TF-IDF algorithm depends on the number of document (Christian et al., 2016; Denzin, 2017): the more documents are analyzed, the more accurate summary of text summarization extraction will be.

That's why Teacher Education Revitalization policies emphasized the application of information technology in educational environment (MOE, 2018a, 2018c), but the results of TF-IDF algorithm excluded word related to information-based teaching. Thus, though these top words can largely provide important information in this study, future research could summarize more documents toward Teacher Education Revitalization policies to promote the validity of extraction results and the development of policy framework and internal logic.

One of the implications of this study is that it provides a new insight in educational policy analysis with text summarization extraction. Text summarization extraction can generate important information that helps researchers and teachers to systematically and holistically understand or implement Teacher Education Revitalization policies. Besides that, this study developed a framework and figured out the internal logic of Teacher Education Revitalization policy, which can be supportive for future researchers and front-line practitioners who are interested in teacher education policy text analysis and teachers' teaching development in different contexts.

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