On the Change and Influence of Big Data on Continuing Education for Mathematics Teachers

Jun Liu
Institute of Applied Mathematics, Qujing Normal University, Qujing 655011, China
Corresponding Author's Email: liujunxei@126.com

Keywords: Continuing education; big data; teacher training; reform; influence

Abstract. The advent of the era of big data has been influencing the way of thinking of teachers for continuing education. The training of mathematics teachers in primary and middle schools has fundamentally changed, which has been transformed from traditional lecture training mode into such training mode as trainees study and develop seminar program with disciplinary knowledge as the subject. And the contents of training are more suitable for practical teaching than subjective supposition. The method of mode has gradually focused on classroom instead of being separated from practice. Individual rather than groups is paid more attention to in terms of training behavior. All of these have realized the training objective of the rapid growth of trainees from trainees to trainers in a real sense.

1. Introduction

In the new round of national training program for primary and secondary schools teachers(short for "national training program") implemented by Ministry of Education and Ministry of Finance in 2015, the educational concept hasn't yet been updated when facing with problems and confusion in the professional development of mathematics teachers in primary and secondary schools in western rural areas. The concept is still the one that is learned in schools in the past, which falls far behind the development of the times and the requirements of new situation on mathematics teachers.[1] Such concept is characterized by old knowledge without update and further study. Teaching methods are undiversified and classroom teaching is inactive. In addition, it won't adopt different teaching methods in accordance with different knowledge. And little attention is paid to mathematics thoughts and methods in teaching which are not integrated into teaching activities. Moreover, mathematics teachers have poor knowledge about the history of mathematics, thus they do not integrate it into the mathematical education to strengthen students' interests and thirst for knowledge and cannot reach such teaching effectiveness as they expect. Besides, students themselves lack learning initiative and study very passively. Although they can solve some mathematical problems depending on their common sense of life and by imitating teachers' way to solve problems, they get lost once problems are different from what they have learned. [2]They cannot understand the real connotation of mathematics and construct their own ways of thinking and knowledge system, thus they cannot be cultivated with mathematical core quality. How to make teachers who attend this program rapidly become trainers in order to "go to the project counties to spread scientific and literacy knowledge" in an effective sense while responding to these actual problems, which poses new challenges for the training of mathematics teachers in primary and middle schools in continuing education. How to solve this difficult problem? After lots of investigation and analysis, we conduct unique "national training program" for mathematics teachers in primary and middle schools and have made substantial achievements. And big data has played a major role in changing the way of training. Trainees who attend this training program use big data to study and research independently and develop seminar programs that are applied in project counties, which are achieved exactly under the guidance of big data. Big data has changed education and provided sound opportunities for the reform of training of mathematics teachers in primary and middle schools in continuing education.

2. Changes and Requirements of "National Training Program" in Continuing Education

Since 2010, Ministry of Education and Ministry of Finance have implemented national training program for primary and secondary schools teachers(short for "national training program"), including exemplary centralized training programs, programs for middle west areas and training programs for kindergarten teachers which mainly train teachers in compulsory schools and kindergarten in rural areas. Teachers in schools with weak foundation in some cities also attended this "national training program". The training methods fall into three categories: replacement for full-time study, short-term centralized training and distance training.

Guidance of Ministry of Education on Deepening the Reform of Training Mode for Teachers in Primary and Secondary Schools to Comprehensively Improve Training Quality in 2003 proposed 8 requirements in response to prominent problems in current teachers training such as generalized contents and undiversified methods without targeted goals and quality supervision, 4 of which are to make the training more targeted in order to train teachers according to their demands; to improve the contents of training to make them more suitable for the actual teaching of frontline teachers in primary and secondary schools; to change the way of training to promote the effectiveness of training, to strengthen the independence of training to stimulate their motivation respectively. The core concept of these four requirements lies in the training which should base on the demands and experience of teachers and satisfy their individual needs, that is "five realities"- real needs, real practice, real classroom, real independence and real enlightenment. However, these "five realities" are hard to be achieved at present. Trainings in many training schools are conducted in the form of lecture, which directly indoctrinates knowledge of pre-job training and the theories of trainers' researches into trainees. Lots of trainers do little in participatory training and are unable to do something in case training, thus they cannot control such training as bases on on-site teaching in the real classroom. [3]As a result, the training curriculum focuses on theoretical knowledge without taking real classroom into consideration, emphasizes explanation instead of interaction and underlines "learning through lecture" while paying little attention to "learning by doing", which makes it hard to combine thinking and learning and unify knowledge and practice.

National training program in 2010 aimed to train teachers in compulsory schools and kindergarten in rural areas, while national training program in 2015 targeted at training trainers. Many teachers themselves who attend this program urgently require experts to train them if they want to grow into qualified trainers in a short time. But now, after short training, they have to train those teachers who are in project counties, which both raises new requirements on national training program and poses severe challenge. Thus, in order to solve the above-mentioned problems, it has to reform training concept and mode. And it is in this kind of challenge that we have made the breakthrough and searched for new effective training mode.

3. Big Data Changes Training Method of National Training Program

Data is an important symbol of information society. Big data is a kind of representation or feature of the development of the Internet to the present stage,[4] which has greatly changed every aspects of the world including educational field. There are three major changes on education: first, the change of thinking path, which transfers from deduction into conclusion. The real important factors influencing education have been found out in the process of "getting rid of experience"; second, highlighting the authenticity of information, [5] which makes information more trustworthy so that researchers can obtain actual situation; third, the possibility of personalized education, which makes education develop from group teaching to individual teaching. The three changes on education that big data brings about must lead to multiple changes on teachers training.[6] With the rapid development of technology, more and more technologies are applied in educational field.

How does teachers' training respond to the challenge of big data in order to make national training program more effective and make trainees grow into trainers? If the whole teachers training program still bases on paper materials, the training effect must be far less than we expect due to the limited information

data. We have made a very efficient attempt on "national training program" and propose new training mode, which has achieved significant results.

3.1 Information management platform for teachers training-- distance learning platform

It is necessary to build information management platform for teachers training in order to achieve modernization and informationization of teachers training. It has clearly been pointed out in *Guidance of Ministry of Education, National Development and Reform Commission and Ministry of Finance on Deepening the Reform of Teachers' Education* that "it should promote information management platform for teachers training", which indicates that our country has attached much importance to the construction of educational informationization. It is worth pleased to see that schools have given huge support to build information management platform for teachers training--distance learning platform and many new computer laboratories. Highly configured computers and distance learning platform have provided material guarantee for trainees' independent study and data retrieval, which has laid solid material foundation for changing teachers training mode.

Such distance learning platform is an online interactive and cooperative system, which is specially designed for teaching, training and conference. Trainees and teachers can interact in a comprehensive manner in this platform in the form of words, video, equation editing and documents. And teachers can check and guide trainees' works. Trainees can modify their own seminar program in the light of teachers' suggestions and interact with teachers, which lays sound material foundation for teachers training. In addition, sharing of training results can promote the change of the way of teachers training, thus improving the efficiency of training.

3.2 Construction of curriculum resources--trainees' independent study and research

Through distance learning platform, the construction of curriculum resources for high quality training has been strengthened and co-building and sharing resources platform has been built. It is a major measure to deepen curriculum reform of national training program for teachers, integrate and use existing resources of teachers training in a scientific manner and give full play to teachers' distance training implemented by schools. In the past, each school does things in their own ways without any communication with other schools, thus causing that a good deal of data and curriculum resources (including generative resources) of teachers training cannot be shared. Such situation is not seen any more. In addition, due to the lack of distance learning platform in the past and limitation of information technology, large amount of data and resources are lost and unused. Therefore, while focusing on developing and building distance learning platform, it should integrate and use the data and resources of teachers' distance training and trainees in a scientific way.

Trainees take advantage of distance learning platform and big data to conduct online learning and discussion. They can know the topic, objectives, requirements, disciplinary knowledge, lectures of training in advance, including the scientific and literacy knowledge that will be spread in the project counties, seminar program, the production and technical requirements specification of micro courses. In the meantime, they can download related data for study and research in advance, make full preparation for centralized training, study and learn from much useful training experience, thus reducing and quickening the transformation period from trainees into trainers.

3.3 Use of big data-developing seminar program

The way to quicken the growth of trainees into trainers is to "go to the project counties to spread scientific and literacy knowledge", but how to achieve this goal? Our college actively adapts to the arrival of big data and firstly comes up with such training mode as trainees study and develop seminar program with disciplinary knowledge as the subject, thus changing the traditional training mode of "national training program" which is characterized by lectures-listening to lectures-attending lectures and infusing new contents into it. [7] And the contents of training are more suitable for practical teaching than subjective supposition. [8]The method of mode has gradually focused on classroom instead of being separated from practice. Individual rather than groups is paid more attention to in terms of training behavior.

Firstly, [9]what trainers and trainees confront with in the era of big data is their own problems in teaching and study, thus three measures have been adopted: the first is to train disciplinary tutors and trainees to collect and download information from Internet; the second is to train them to independently build curriculum resources (including micro courses, generative resources), which is the required skill for teachers; the third is to apply data technique into training or teaching activities,[10]which can help trainees to realize targeted study and satisfy their individualized study.

Secondly, under the guidance of disciplinary tutors, trainees can search related information from Internet for seminar program to study independently, conduct communication and discussion, sort out and process data and gain useful information and data. Moreover, they can relate to the topic of seminar program and connect actual teaching to infuse new teaching method into training under the guidance of educational theories, which has promoted the informationization of national training program and has been increasingly changing teachers' study and work. Information environment is the living environment for teachers in the future.

Thirdly, under the guidance of disciplinary tutors, educational theories and teaching methods, trainees can draw up scripts, make PPT of special lectures and micro courses that solve core issues for project counties to spread scientific and literacy knowledge, and finish research and development task for seminar program. With limited time and heavy tasks, trainees have successfully finished the research task of seminar program for project counties to spread scientific and literacy knowledge after diligent study and efforts.

4. Summary

Although we are in the era of big data, the key problem lies in insufficient exploitation and use of these data. Based on three principles of teachers learning, the key for teachers learning process is the externalization of tactic knowledge. Practical knowledge is shared through watching teaching. And it should emphasize design and carry out explicit knowledge in their practices. Teachers should not be separated from their own practice, from reflection on educational experience and from educational theories and teaching methods when attending training and research. The growth of a teacher is a kind of reform caused by his/her own demands and experience, which means that the goal of teachers training is their growth. It should emphasize the research on classroom for trainees, which are reflection on teaching practice. Therefore, it is necessary to seek for the changes in the aspects of system, mechanism, strategy, technology and so forth. And the advent of the era of big data provides sound opportunities for the reform of teachers training mode and transforms it from traditional training mode into such training mode as trainees study and develop seminar program with disciplinary knowledge as the subject, which infuses new methods and contents into teachers training for continuing education. And the contents of training are more suitable for practical teaching than subjective supposition. The method of mode has gradually focused on classroom instead of being separated from practice. Individual rather than groups is paid more attention to in terms of training behavior. We should fully exploit and use big data and understand the development tendency of the mode of national training program from the present and future of big data from the perspective of concept, method and application. It should start out from problems to help mathematics teachers in primary and secondary schools in rural areas to solve actual problems under the guidance of target with the support of theory, methods and practice in order to improve their logical system of mathematics teaching ability, which has changed training concept and method of mathematics teachers in primary and secondary schools in continuing education, created new methods and mode and realized the training objective of the rapid growth of trainees from trainees to trainers in a real sense, thus achieving remarkable results.

5. Acknowledgment

In this paper, the research was supported by Chinese Natural Science Foundation (Project No. 11361048), Yunnan Natural Science Foundation (Project No. 2017FH001-014) and Qujing Normal University Natural Science Foundation (Project No. ZDKC2016002).

6. References

[1]. Y.Q.Run, L.F.Huang and L.Jing, "Analysis of the training content framework of primary and secondary school teachers' information technology ability," Education informatization in China, vol. 28, No.16, pp.82-85, August 2009.

[2]. Z. Lin, "Principles and applications of large data technology - concepts, storage, processing, analysis and application (2nd edition)," People's post and Telecommunications Publishing House, 2017:56-62.

[3]. L.Zhou and D.Huang, "Research on TPACK (Integrated Technology of Subject Teaching Knowledge) Development Model of Rural Teachers Based on Teaching Process," Primary and secondary school teacher training, vol. 26, No.8, pp.9-13, August 2016.

[4]. M.Zaharia, M.Chowdhury, J.Franklin, S.Shenker and I.S. Stoica, "Cluster Computing with Working Sets," HotCloud, vol.35, No.10, pp.10-16, October 2010.

[5]. A.Ghodsi, M.Zaharia, S.Shenker and I.Stoica, 'Choosy: Max-Min Fair Sharing for Datacenter Jobs with Constraints," Computer Science, vol.32, No.4, pp.124-135, April 2013.

[6]. M.Isard, V.Prabhakaran, J.Currey, U.Wieder, K.Talwar and A.Goldberg, "Fair Scheduling for Distributed Computing Clusters," Storage Technologies," vol16, No.2, pp.261-276, February 2009.

[7]. J.Liu, H.Y. Luo, X.Liu, "Oscillation criteria for half-linear function differential equations with damping", Thermal Scienc, vol.18, No.5, pp.1537-1542, October 2014.

[8]. J.Liu, Z.D.Dai, G.Mu and X.Liu, "New abundant exact solutions for Kundu equation," Acta Mathematicae Applicatae Sinica, vol.38, No.3, pp.729-734, June 2015.

[9]. J.Liu, G.Mu, Z.D.Dai and H.Y.Luo, "Spatiotemporal deformation of multi-solution to (2+1)-dimensional KdV equation. Nonlinear dynamics," vol.83, No.3, pp.1537-1542, January 2016.

[10]. Y.H.Zeng, L.P.Luo and Y.H.Yu, "Oscillation for Emdewn-Fowler differential equations of neutral type," Acta Mathematica Scientia, vol.35, No.4, pp.803-814 April 2015.