

The Difference Evaluation of the ICT Competency to University Teachers from Two Perspectives in the Era of Mobile Internet

Zhiguo Xiao¹, Xiaoli Chu^{2,3}, Zengrong Wu¹, Yan Zhang^{1*}

¹ Faculty Development and Educational Technology Center, Guangdong University of Finance and Economics, Guangzhou, Guangdong, China

² School of Economics and Management, Xidian University, Xi'an, Shanxi, China

³ Network Center, Guangdong AIB Polytechnic College, Guangzhou, Guangdong, China
zhangyan@gdufe.edu.cn

Article Info

Volume 83

Page Number: 261 - 269

Publication Issue:

July - August 2020

Abstract

In the era of mobile Internet, the combination of information technology and teaching activities is increasingly close, and information technology means are increasingly rich. The competency of teachers' Information and Communications Technology (ICT) has become a necessary condition in the teaching process, and how to evaluate it accurately is the key problem. For teachers' ICT evaluation, however, there are significant differences between students and teachers. According to the two-dimensional analysis framework based on 7D4L, this paper carries out a questionnaire research. Based on the specific framework content of 28 modules in the evaluation system of teachers' ICT competency, two sets of questionnaires based on teachers' and students' perspectives are designed. The evaluation of teachers' ICT competency is carried out from the subjective and objective perspectives, and the differentiation problem is studied through the differential evaluation between students and teachers. Through the comparative study of the results of the questionnaire, this paper analyzes the causes and effects of the conclusions of consistency and difference. Finally, the main strategies to improve teachers' ICT competency are put forward.

Article History

Article Received: 06 June 2020

Revised: 29 June 2020

Accepted: 14 July 2020

Publication: 25 July 2020

Keywords: University Teachers, ICT, Dual Perspectives, Questionnaire, Differentiation

1 Introduction

With the rapid development of mobile Internet, cloud computing, big data, intelligent terminal and other information technologies, the application methods, methods, scenarios and effects of educational information technology are also changing with each passing day, which has a huge impact on the methods of teaching knowledge, the ways of obtaining knowledge, the development

direction of students and the construction of teaching environment. Accordingly, information technology gives more flexible teaching methods, and sets higher goals and requirements for teachers' teaching methods: that is, changing from a single teaching method to a teaching method of cultivating students' independent discovery, meaning construction and knowledge innovation. Therefore, the great development and reform of information technology force teachers to implement a comprehensive and thorough reform in the

whole teaching process, such as teaching objectives, teaching contents, teaching methods and classroom structure [1].

According to the requirements of ‘The ten year plan for educational informatization (2011-2020)’ and ‘the 13th five year plan for educational informatization’ of China, through various ways and means to help teachers improve the competency of ICT, closely combine the construction of teachers' ICT competency with subject development and teaching activities, pay attention to the summary and refinement of the deep integration of information technology and lesson, enhance the ability of teachers to carry out teaching analysis and realize personalized teaching by using information technology, and then realize the teaching reform guided by information and communications technology, thus promote the normalization of information-based teaching.

Horizon report of New Media Alliance: 2014 basic education edition points out that ‘reshaping the role of teachers’ is the key factor for the application of school education technology in the future [2]. The extensive application of information technology in the field of education and teaching, especially the wide use of terminals, platforms and application software in the mobile Internet era, provides new ways to enhance teachers' ability development, such as network learning community, WeChat public address, special learning network station, mobile phone APP and so on, which provides a good way for teachers' professional growth and knowledge building. The platform has played a huge role in the process of teachers' ICT competency.

Chinese teacher training has always emphasized ‘on-demand training’. Some researchers [3] pointed out that ‘demand’ cannot be simply understood as the needs of middle school students in teaching activities, but as the distance between a certain ability of teachers and the standards to be achieved. So what is the standard that the teacher's ICT should reach? What are the influencing factors, development paths, construction strategies

and promotion methods of teachers' ICT competency [4]? How to effectively implement the evaluation of teachers' ICT competency?

The usual method is to evaluate teachers by questionnaire and in-depth interview. But the key problem is: teachers consider their ICT competency from the perspective of the first person, which is significantly different from the students' feelings under the third person. How to evaluate the competency of teachers' ICT? We should not only start from the teacher, but also listen to the voice of the object. The perspectives of both teachers and students are subjective. Therefore, it is very important to study the differences between teachers and students. It has strong pertinence and applicability to evaluate the competency of ICT to University Teachers in the era of mobile Internet. It can not only consider the differences, clear the consistency, but also analyze the differences the deep-seated reasons play a positive role in improving the teaching effect and improving the competency of teachers' ICT.

In order to promote the improvement of college teachers' ICT competency and solve the cognitive differences between teachers and students from different perspectives, this paper defines the index system in the era of mobile Internet based on 7D4L two-dimensional analysis framework. Secondly, a questionnaire is designed for both teachers and students. On the basis of effective recovery, statistics and analysis, the reasons of consistency and difference are further discussed. Finally, through the comparative analysis of the differences, the paper puts forward the reasons and ways to improve the cognitive differences between teachers and students from different perspectives, which provides a new way to comprehensively improve the competency of information technology of university teachers.

2 Framework based on 7D4L

How to evaluate teachers' ICT competency qualitatively and quantitatively, what framework to

use, and how to select key indicators are the prerequisites of the study. Because there are many factors that affect the competency of teachers' ICT, the weight of the factors under the framework is also very different, and the system indicators in different stages of development are also adjusted accordingly. Some scholars believe that the development of teachers' ICT competency is affected by many factors, such as teacher training, teaching practice, teaching reflection, independent learning, peer assistance, expert guidance, etc. [5-10]. Based on the main influencing factors, researchers from different countries around the world have established various research frameworks. The most international framework for the study of teachers' ICT competency is the UNESCO ICT Competency Framework for teachers, which was promulgated by UNESCO in 2011 and has become a global model and leader in relevant research fields. The main content is divided into 6 dimensions: ICT in education policy and vision, Curriculum and assessment issues, Pedagogy, ICT, School organization and administration, and Teacher professional development, as well as technical literacy, knowledge deepening, knowledge creation, a total of three development stages, a comprehensive overview of the development of teachers' ICT competency index value and process. China has promulgated the standard for the competency of information technology of primary and secondary school teachers (for Trial

Implementation), which mainly includes five dimensions and 45 indicators including technical literacy, planning and preparation, organization and management, evaluation and diagnosis, learning and development [11]. The establishment of the evaluation index system of teachers' ICT competency provides an ideal evaluation method for quantitative research. The indicators under the research framework can monitor and evaluate the properties of related objects to reflect the development process and results of the objects. The core evaluation index plays a key role in reflecting the characteristics of the object. J. Liu [8], et al. put forward a two-dimensional analysis framework of 7D4L (7 dimensions 4 levels) based on the dimension content and development process of UNESCO ICT Competency Framework for teachers and Chinese standard for primary and secondary school teachers' information technology competency (Trial). See Table 1 for the framework dimension, development stage and specific indicators. In the process of the implementation of the research, mainly in the form of questionnaires and in-depth interviews, many scholars use the form of questionnaire to obtain and analyze relevant issues, such as core indicators and stage questions [13], teachers' ICT competency monitoring and evaluation [14], teachers' ICT competency improvement strategies in the network environment [15], etc.

Table 1. Key words of 28 modules in the framework.

| | Technology literacy | Knowledge acquisition | Knowledge deepening | Knowledge creation |
|------------------------------------|------------------------|------------------------|-------------------------|--------------------|
| ICT in education policy and vision | Policy awareness | Policy understanding | Policy application | Policy innovation |
| Curriculum design | Basic knowledge | Teaching application | Learning application | Skill training |
| ICT | Basic tools | Interactive tools | Complex tools | Creative tools |
| Pedagogy | Technology exploration | Integration technology | Complex problem solving | Self-management |

| | | | | |
|--|------------------------|---------------------|-------------------------|--------------------------|
| School organization and administration | Standard classroom | Digital classroom | Collaborative group | Learning organization |
| Assessment and diagnosis | Standardized test | Multiple evaluation | Personalized evaluation | Comprehensive evaluation |
| Teacher professional development | Professional awareness | Digital literacy | Management and guidance | Professional guidance |

2.1 Framework and modules

This research is based on the 7D4L two-dimensional analysis framework of J. Liu and J. Kong. At the same time, teachers and students use the form of questionnaire, and modify part of the questionnaire content. The main content of the revision is the application of the integration of information technology means and teaching in the era of mobile Internet. The main content of the questionnaire is: whether the teacher has met the requirements of the 28 keywords mentioned in the above 4 stages and 7 dimensions in Table I. The purpose of this paper is to evaluate the difference of teachers' ICT from the perspective of teachers and students. Through comparative study, we can judge the problem of consistency and differentiation in cognition, analyze the root cause of the problem and the misunderstanding of understanding, and put forward improvement methods to comprehensively improve the information technology ability of teachers and enhance the teaching effect.

2.2 Questionnaire design, recovery and statistics

Based on the specific framework content of 28 modules in the evaluation system of teachers' ICT

competency, this study designs two sets of questionnaires based on Teachers' and students' perspectives, implements the evaluation of teachers' ICT competency from the subjective and objective perspectives, and studies the problem of differentiation through the differential evaluation. The questionnaire for teachers and students contains 66 questions and 60 questions respectively, among which the first 7 questions are the information input based on the former, the middle 54 questions are the single choice evaluation questions of teachers' ICT competency, and the last 5 questions are multiple questions, which are consistent with the diversity and richness of information technology in teaching application; the structure of the corresponding latter is similar, and the first 7 questions are the information input based on the former, the middle 43 questions are single choice questions to evaluate the teachers' ICT competency, and the last 10 questions are students' perception of information technology, suggestions and opinions on information technology improvement, etc. The questionnaire design from the perspective of teachers and students can be seen in Table 2 and table 3.

Table 2. Teacher questionnaire questions and 28 modules.

| | Technology literacy | Knowledge acquisition | Knowledge deepening | Knowledge creation |
|------------------------------------|---------------------|-----------------------|---------------------|--------------------|
| ICT in education policy and vision | 8 | 9/10 | 11/12 | 13/14 |
| curriculum design | 15 | 16/17 | 18/19 | 20/21 |
| ICT | 22/23 | 24/25/26 | 27/28/29 | 30/31 |
| Pedagogy | 32/33 | 34/35/36 | 37/38/39 | 40/41 |

| | | | | |
|--|----|----------|----------|----------|
| School organization and administration | 42 | 43/44/45 | 46/47/48 | 49/50 |
| Assessment and diagnosis | 51 | 52/53/54 | 55/56/57 | 58/59/60 |
| Teacher professional development | 61 | 62 | 63/64 | 65/66 |

Table 3. Student questionnaire questions and 28 modules.

| | Technology literacy | Knowledge acquisition | Knowledge deepening | Knowledge creation |
|--|---------------------|-----------------------|---------------------|--------------------|
| ICT in education policy and vision | 8 | 9/10 | 11/12 | 13/14 |
| curriculum design | 15 | 16/17 | 18/19 | 20/21 |
| ICT | 22/23 | 24/25/26 | 27/28/29 | 30/31 |
| Pedagogy | 32/33 | 34/35/36 | 37/38/39 | 40/41 |
| School organization and administration | 42 | 43/44/45 | 46/47/48 | 49/50 |
| Assessment and diagnosis | 51 | 52/53/54 | 55/56/57 | 58/59/60 |
| Teacher professional development | / | / | / | / |

This questionnaire design uses the questionnaire star system, through the mobile data collection, real-time collection of data to the questionnaire star background, and within two months to a liberal arts university in Guangdong Province teachers and students. In the period of validity, 3547 valid teachers and students questionnaires and 5456 valid teachers and students questionnaires were received respectively. According to the proportion of valid samples and the total number of samples, the effective rate was 85.6%, and the data validity was ideal, which met the requirements of comparative study.

What should be explained in the questionnaire is that except for the four items in "teachers' professional learning", which are only set for teachers' perspective and not open to students' perspective, the rest data are consistent with the topic. For the overall evaluation, the symbol "√" indicates that

an indicator meets the set requirements, while "×" indicates that it is not up to the standard.

For different types of questions, consider the following arrangements: Likert scale, the scores are set as 1-5 points in turn, with 5 options in total. Only when the average score is greater than or equal to 3 points, the "√" sign is used, otherwise "×" is used to mark; "yes" or "no" design questions are set as 1 point, "no" is 0 point, and the average mark score is greater than or equal to 0.5 points are "√", otherwise "×"; if the topic is in the form of check, set each option as a single small topic, refer to the topic designed by the previous "yes" or "no" option, set "yes" as 1 point, no "as 0 point, mark average score greater than or equal to 0.5 points as "√", otherwise "×".

Through SPSS analysis, the overall situation of teachers' ICT competency from the perspective of teachers and students can be reflected in Table 4 and table 5.

Table 4. The overall situation of teachers' ICT competency from the perspective of a university teacher.

| | Technology literacy | Knowledge acquisition | Knowledge deepening | Knowledge creation |
|--|---------------------|-----------------------|---------------------|--------------------|
|--|---------------------|-----------------------|---------------------|--------------------|

| | | | | |
|--|-----|-------|-------|-------|
| ICT in education policy and vision | √ | √/√ | √/× | ×/× |
| curriculum design | √ | ×/√ | √/× | ×/× |
| ICT | √/√ | √/√/√ | √/√/√ | √/× |
| Pedagogy | √/√ | √/√/√ | √/√/× | ×/× |
| School organization and administration | √ | √/√/√ | √/√/√ | √/× |
| Assessment and diagnosis | √ | √/√ | √/√/√ | √/×/√ |
| Teacher professional development | √ | √ | √/× | ×/× |

Table 5. The overall situation of teachers' ICT competency from the perspective of a university student.

| | Technology literacy | Knowledge acquisition | Knowledge deepening | Knowledge creation |
|--|---------------------|-----------------------|---------------------|--------------------|
| ICT in education policy and vision | √ | √/√ | √/× | ×/× |
| curriculum design | √ | ×/√ | √/× | ×/× |
| ICT | √/√ | √/√/√ | √/×/× | ×/× |
| Pedagogy | √/√ | √/√/√ | √/√/× | ×/× |
| School organization and administration | √ | √/√/√ | ×/×/√ | ×/× |
| Assessment and diagnosis | √ | √/√ | √/×/× | ×/×/× |
| Teacher professional development | / | / | / | / |

3 Analysis and discussion of questionnaire

According to the comparison between table 4 and table 5, the teachers and students of a liberal university in Guangdong Province of China agree that the teachers' ICT competency has generally reached the stage of "knowledge deepening". As the survey object is "undergraduate", which has not yet reached the realm of creative learning, comprehensive research and exploration, and professional guidance of "Master graduate" and "doctoral graduate", a few indicators have reached the stage of knowledge creation.

3.1 Consistency conclusion from different perspectives

From the ICT in education policy and vision, teachers and students have the same answers to the questionnaire from different perspectives. It is generally believed that teachers can have enough

depth in the application of policies, can make progress with the times in the promotion and development of information technology in the field of education in combination with national and local governments, and improve teaching practice activities in combination with information technology.

From the perspective of curriculum design, the questionnaire answers of teachers and students from different perspectives are relatively consistent. It is generally believed that the corresponding curriculum system and experimental curriculum arrangement have a good combination with ICT, which is helpful to show the theoretical system, practical process, comprehensive experiment and other links of subject knowledge, covering the curriculum and subject knowledge comprehensively.

3.2 Different conclusions from different perspectives

ICT is one of the most controversial indicators. The questionnaire shows that teachers generally think that they can make better use of information technology tools, such as projectors, electronic whiteboards and other equipment, as well as office and other auxiliary software, as a complex tool or even a creative tool to bring the ideal teaching effect. However, students generally think that teachers' ICT tools are still not advanced enough, teaching information technology means are still backward, and the most advanced interactive teaching method, information exchange means of mobile terminals, full-automatic recording and broadcasting, data acquisition and analysis technology are not used. Obviously, teachers are more concerned about knowledge transfer, while students are more concerned about information technology means; young teachers are more prominent than older teachers in information technology ability; male teachers are better at using popular information technology tools than female teachers, and more abundant in ways; science and engineering teachers are more willing to use information technology to improve teaching effect than liberal and art teachers.

There is also a huge controversy in the process of evaluation and diagnosis. The questionnaire shows that students generally believe that teachers have not made a comprehensive and comprehensive evaluation on them, and only make multiple evaluation or personalized evaluation on key points such as curriculum and examination. As a matter of fact, teachers have kept their focus in the whole process of teaching, and their energy and judgment have exceeded students' expectation and understanding. Teachers use ICT to collect learning process data, and use classification, summary and statistical tools to effectively diagnose students' learning situation. They not only have a clear understanding of learning attitude and test results, but also pay attention to teaching

practice, experimental courses and comprehensive abilities. In particular, there are additional investigations on creative thinking, scientific research ability and academic initiative to determine whether the undergraduate stage can continue to improve the ability to enter the master's and doctors' graduate stage and to carry out scientific research work after the completion of the undergraduate stage.

There is a small difference between organization and management. Students generally think that in addition to collaborative groups, more learning organizations can be considered in order to carry out more flexible teaching methods. Teachers consider more suitable teaching methods for undergraduates, which lacks trend to some extent. However, in combination with the actual background of undergraduate teaching, the organization and management form is reasonable to some extent .

As far as the pedagogy is concerned, there are some small differences to some extent, but basically there are not too many differences. The form is mainly classroom teaching, some experimental courses are completed according to the teaching requirements, and the rest are in the form of independent learning, which basically reflects the teaching characteristics of liberal colleges and universities. In solving comprehensive and complex problems, teachers and students have the same cognition.

3.3 Ways to improve teachers' competency of ICT

From the perspective of ICT in education policy & vision and curriculum design, teachers still need to strengthen learning, strive to improve their understanding of education policies, constantly enhance their teaching skills, and strive to achieve "policy innovation" and "skill training" in the stage of knowledge creation.

In terms of ICT, besides imparting knowledge itself, teachers should try to combine more cut-

ting-edge information technology, especially the terminal, platform, system and other tools in the era of mobile Internet, through WeChat, APP, small program and other means to achieve more interactive teaching, eliminate the constraints brought by various subjective factors as much as possible, and mobilize the enthusiasm of students in all aspects to improve teaching effect.

From the perspective of evaluation and diagnosis, teachers should continue to strengthen the investigation in the learning process and all-round evaluation of students' abilities. What needs to be improved is to strengthen the communication with students, give more full answers to the evaluation and diagnosis, so that students can understand the evaluation standards and key indicators, and at the same time, facilitate students to play their learning initiative and creativity faster, so as to prepare for the next step.

In terms of organization and management, pedagogy, teachers can adopt the most cutting-edge smart classroom and other environments to carry out curriculum reform and curriculum experiments, so as to make organizational learning more free, flexible and rich.

4 Conclusion

With the rapid development of information technology, the ICT competency of teachers has inevitably become a necessary condition to evaluate the teaching effect. How to further promote the deep integration of information technology and teaching is an important issue in the era of mobile Internet, and with the technological innovation, the evolution is more and more critical. According to the 7d4l two-dimensional analysis framework, this paper studies the index system under the framework. Based on the effective recovery, statistics and analysis, this paper analyzes the reasons for the consistency and difference, and gives a reasonable explanation. Then, through the comparative study of differences, the paper clarifies the root causes and improvement methods of in-

dex disputes in different perspectives, and points out new research ideas for comprehensively improving the competency of teachers' ICT.

Acknowledgments. This research was supported by Distinguished Young Talents in Higher Education of Guangdong, China (GRANT_NUMBER: 2017WQNCX055), and National educational information technology research project, China (GRANT_NUMBER: 176140006).

Statement. This paper has been published at the 6th International Symposium on Educational Technology (ISET 2020). It has been revised and developed on the basis of the conference paper.

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