# The status and future of information technology teachers at middle and high schools in China

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ABSTRACT: Given the wide application of information technology, IT education at middle schools is a key issue. Using data released by the Ministry of Education in China on middle and high school IT teachers over 10 years, teacher numbers, gender balance, staff qualifications, and geographical distribution of IT teachers in urban and rural areas, were analysed in this study. It was found that 1) the number of IT teachers in middle schools has increased rapidly over 10 years, but there is still a big gap compared with demand; 2) two-thirds of middle school IT teachers are male, and those with high ability are prone to changing jobs; 3) staff qualifications of middle school IT teachers have reached the required, basic level - excessive pursuit of further formal schooling should stop, and instead teaching ability should be strengthened; and 4) IT teachers in rural areas gradually are moving to cities and county towns, resulting in a gradual decline of the number of IT teachers in those areas. IT hardware used in middle school should be updated and IT teachers' knowledge improved to meet future demand for IT education at middle schools.

## INTRODUCTION

With the development and popularisation of information technology (IT) in China, more middle and primary schools provide information technology courses. In October 2000, the *National Middle and Primary School Information Technology Education Job Meeting* was held. Since then, IT education in middle and primary schools in China has entered a new stage of fast development. At the same time, the release of regular *High School Technical Curriculum* reports on IT promotes the standardised development of IT education in high schools.

Information technology teachers are the implementers and promoters of IT courses, so their own development directly influences the quality and promotion of IT. Chinese and foreign scholars have carried out many studies concerning teachers in middle and primary schools. These studies have covered teachers' professional development [1], the ability and quality of teachers [2] and teachers' professional skills [3].

So, what is the overall situation for the development of teachers in middle and primary schools in China? What are the trends? The answers to these questions are urgent, since they directly influence the formulation and implementation of IT education policies.

Data about teachers from 2001 to 2012 in Chinese middle schools has been recently released by the Ministry of Education. These data provide information on the number, gender, qualifications, and rural and urban spatial distribution of Chinese middle school teachers. The development trends are outlined in this report to support the planning for IT teachers and to assist education policy formulation.

## CHANGE IN THE NUMBER OF REGULAR MIDDLE SCHOOL INFORMATION TECHNOLOGY TEACHERS

After the October 2000 meeting, there was a rapid increase in the number of teachers in middle schools. Over the period 2001 to 2012 the number of full-time teachers in middle schools increased, from 44,612 to 126,448 - increasing nearly threefold - with an average annual growth of nearly13%; the growth rate at the start of the period, from 2000 to 2004, averaged 22%.

Up to 2008, the number of IT teachers continued to increase; but after that, the number has been stable, accounting for 2.5% of all teachers in 2012, up from 1.11% in 2000. In 2008, the proportion reached 2.6%, see Figure 1.

The situation of full-time teachers in regular junior high schools was similar to that in high schools. The growth rate from 2000 to 2008, was high and after a slight fall in 2009 the number remained stable (Figure 2). More than twice the number of full-time teachers were in junior middle schools than in senior middle schools.

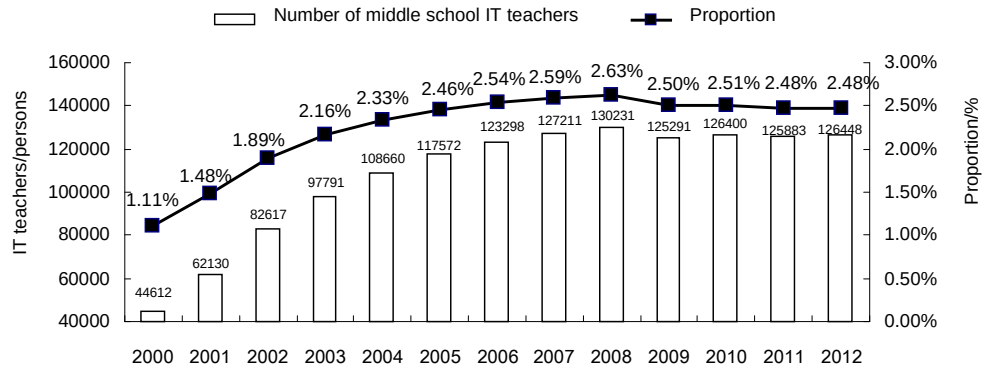


Figure 1: The number of IT teachers in regular middle schools in 2000-2012.

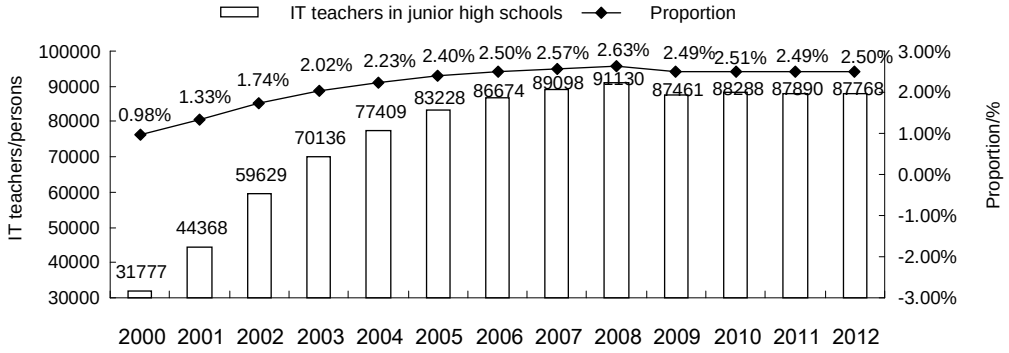


Figure 2: The number of IT teachers in junior high schools in 2000-2012.

From 2000 to 2008, full-time information technology teachers in junior high school and high school increased (Figures 2 and 3), but the growth rates were different.

The proportion of full-time teachers increased, from 0.98% of the total teachers in 2000 to 2.63% in 2008 in junior high schools, while the proportion in high schools increased, from 1.70% in 2000 to 2.65% in 2008.

The proportion of teachers in senior middle schools increased rapidly from 2000 to 2008. After a slight decline in 2009, the numbers were then stable. The proportions decreased after 2008.

The proportion of information technology teachers in junior middle schools decreased to 2.5% and, then, remained stable. However, the proportion of information technology teachers in senior middle schools decreased slowly. From 2012, the proportion decreased to 2.41%.

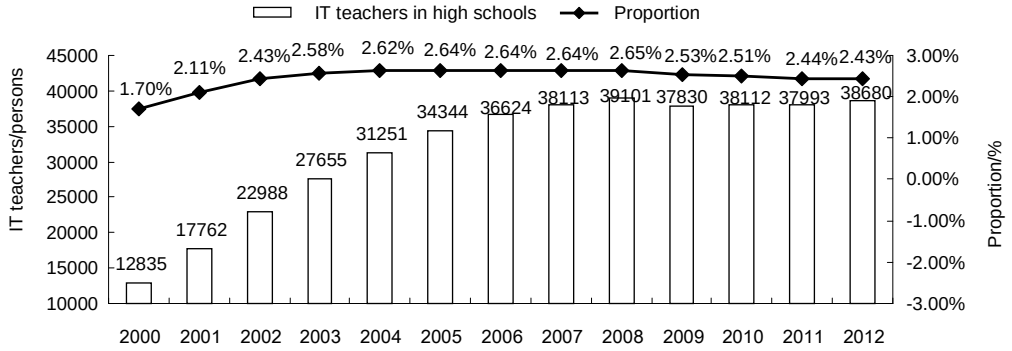


Figure 3: The number of IT teachers in high schools in 2000-2012.

CHANGE IN GENDER PROPORTION OF INFORMATION TEACHERS IN MIDDLE SCHOOLS

About two-thirds of IT teachers in middle schools are male. In junior high schools and high schools, the change of gender balance of teachers from 2001 to 2012 has been different.

In regular junior high schools, the proportion of male teachers increased slightly by 1.63% to 63.25%, while the proportion of male teachers in high schools decreased slightly by 1.52% to 61.39% (Figures 4 and 5).

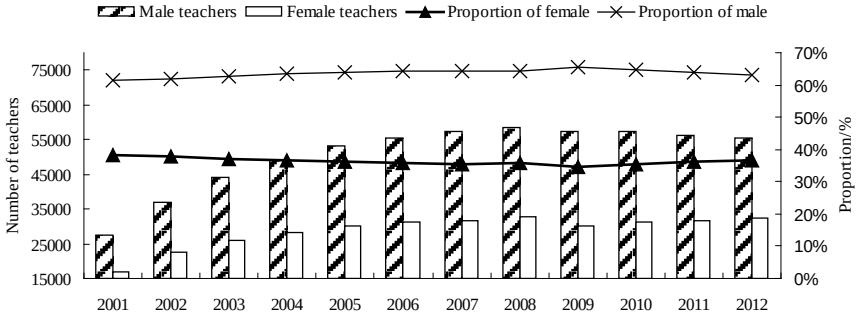


Figure 4: Gender balance of IT teachers in junior high schools.

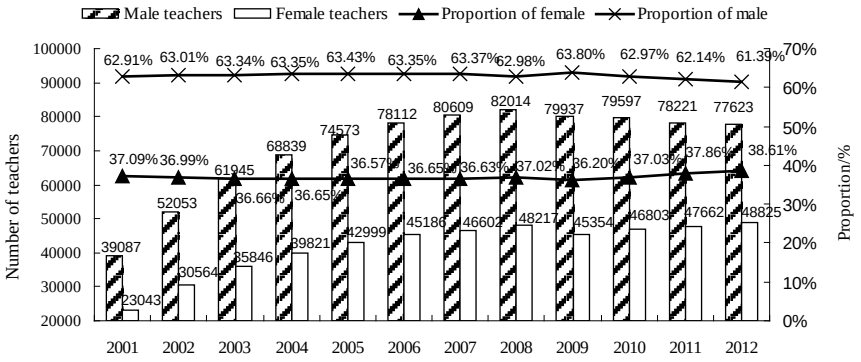


Figure 5: Gender balance of IT teachers in high schools.

QUALIFICATIONS OF TEACHERS IN MIDDLE SCHOOLS

The proportion of teachers with qualifications in middle school has constantly improved and reached a high level. Some IT teachers completed in-service training after formal schooling, but more schools increasingly emphasised educational qualifications when employing teachers. In many places, a teacher must have a Bachelor's degree when employed.

In junior high schools, while there are more information technology teachers with higher educational qualifications, the proportion of teachers educated in junior college decreased, from 69% in 2001 to 29% in 2012; the proportion with a Bachelor's degree increased, from 19% to 69% in 2012. From 2001 to 2012, the proportion of junior high school teachers who were qualified increased by 11%, from 88% in 2001 to 99% in 2012, which was higher than the average rate of all junior high school teachers (IT and non-IT) at 98%, see Figure 6.

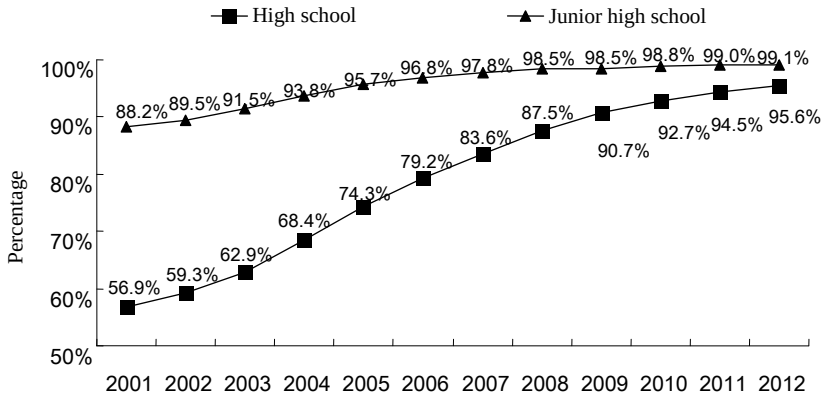


Figure 6: Proportion of IT teachers with qualifications.

The situation concerning education qualifications (degrees) among senior middle school teachers was similar to that of junior middle school teachers. The proportion of senior middle school teachers who were qualified increased, from 57% in 2001 to 96% in 2012, increasing by nearly 40%. The proportion of teachers with a Bachelor's degree increased, from 56% of 2001 to 92% in 2012.

The proportion of teachers with a Bachelor's degree in high middle school is far greater than that in junior middle school. Furthermore, the number of teachers in high schools with a postgraduate degree in high middle schools has increased, from 73 in 2001 to 1,290 in 2012.

## GEOGRAPHIC DISTRIBUTION OF HIGH SCHOOL IT TEACHERS

High school teachers are classified based on geographic region (city, county, rural). Referring to Figure 7, the number of city high school teachers increased constantly, from about 12,000 in 2004 to 18,000 in 2012. However, the high school teachers in rural areas have constantly decreased, from about 3,700 in 2004 to 1,300 in 2012.

The number of county high school teachers first increased until 2010 and, then, decreased. The number of both city and county junior high school teachers constantly increased, from 2004 to 2012. However, the county's numbers increased faster. In 2004, there were about 26,000 junior high school information technology teachers in the counties. In 2012, the number had increased to 42,000. The number of rural junior high school teachers decreased, from about 35,000 in 2008 to 21,000 in 2012.

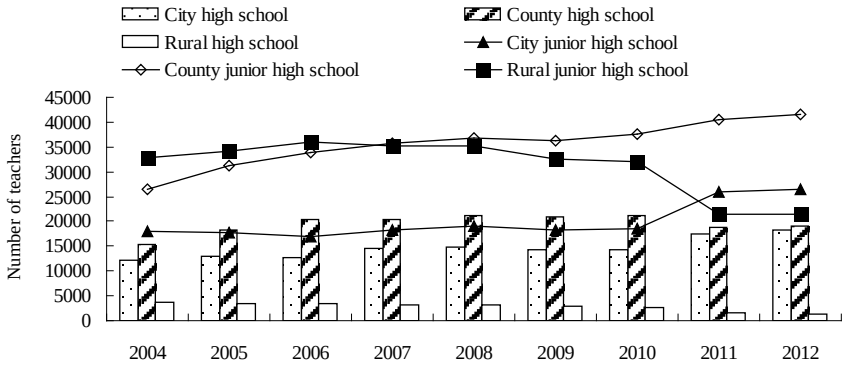


Figure 7: The regional distribution of high school IT teachers.

## DISCUSSION AND CONCLUSIONS

Through the analysis of number, gender balance, educational qualifications, and rural and urban spatial distribution of Chinese middle and high school information technology teachers from 2000 to 2012, the conclusions below have been reached.

*The number of middle school IT teachers has shown rapid growth, but the gap between the actual and required number is large:* from 2000 to 2012, Chinese middle school information technology teachers increased quickly, from 44,612 to 126,448, nearly tripling. This was closely related to a national focus on middle school IT education. In October 2000, the National Middle and Primary School Information Technology Education Job Meeting established the goals for Chinese information technology education. Then, many middle schools began an information technology course and so information technology became a required course. This caused the demand for IT teachers to increase suddenly.

Currently, the number of IT teachers accounts for 2.5% of all teachers. According to the statistics, there are 53,200 junior high schools (including 49 vocational high schools) with 47,630,600 students, and 13,509 high schools with 24,671,700 students. According to these statistics, there are 72,302,300 students who potentially need to take an IT course. If an information technology class is provided twice every week for 50 students, all students are required to do IT, and every information technology teacher gives 12 lessons per week [4], 241,000 information technology teachers are needed. However, there are only 126,000 information technology teachers, leading to a gap of 50%. Junior high schools require an extra 71,000 IT teachers, and high middle schools an extra 44,000. Primary, junior high- and high-school student numbers are decreasing year by year, while the number of information technology teachers is relatively steady. However, the gap still will remain very large for the next 10 years.

*Two-thirds of information technology teachers in middle schools are male and the most talented tend to leave:* information technology teachers not only take charge of information technology teaching, but also undertake such tasks as computer laboratory management and teaching equipment maintenance. With the relatively high technical content of the work and males' strong practical ability [5], they are viewed as more suitable for the position. This is why there are more male than female teachers and, despite the rapid growth of the number of information technology teachers, the proportion that are male has remained constant.

Information technology is excluded from college entrance examinations, and so is not pursued as vigorously by those seeking admittance to prestigious universities. Information technology teachers, therefore, have a lower status compared with other major subject teachers. Thus, some male teachers with a strong competency choose the career with greater technical content and higher income by job-hopping to software and computer maintenance positions [6]. This phenomenon is obvious among middle school IT teachers. This is also the main reason for the decrease in number of male middle school information technology teachers.

*Educational qualifications of high school information technology teachers are already at a good level but teaching must be improved:* the educational qualifications of middle school information technology teachers already exceeds the basic required level and has improved greatly over the past 10 years. Fully 99% of junior high school information technology teachers have a degree above junior college, and 96% high school information technology teachers have a Bachelor's degree or above. The number of postgraduates has also increased greatly, from 123 in 2001 to 2,162 in 2012.

In terms of educational degrees, Chinese information technology teachers seemingly reach or exceed the level of many developed countries. Is this an authentic appraisal of Chinese middle school information technology teachers? This question must be considered carefully. Chinese people always like to pursue educational degrees. From a national perspective, the State Council of the People's Republic of China's decision on Deepening Education Reformation and Comprehensively Promoting Quality Education makes it clear that full-time junior middle school information technology teachers must be educated in junior college or obtain a Bachelor's degree. A proportion of full-time teachers and principals in high schools must have a Master's degree [7]. Thus, many schools regard a degree as the first condition for recruitment and only then consider competency.

In recent years, newly employed information technology teachers have had relatively high educational degrees. Moreover, teachers in good geographic regions have higher educational degrees. In a very few regions, a Master's degree is demanded for junior middle school information technology teachers. An individual's degree is critical in determining status and treatment. Thus, teachers pursue educational degrees.

Meanwhile, the management of departments also promote policies to encourage full-time teachers to pursue a succession of degrees, e.g. adult junior college, Bachelor's, Master's and doctoral education [8]. Such an educational pursuit has a doubtful function in improving the overall quality of information technology teachers. Interviews with middle school information technology teachers reveal that their degree does fully represent his/her teaching ability. Experience and personal development are the key factors. Once they have a degree that meets the basic requirement, teachers should stop pursuing further degrees. Information technology teachers instead should improve their competency.

*The number of middle school information technology teachers in city or county towns has increased gradually, while the number in rural areas has declined gradually:* the overall trend of geographic distribution is for information technology teachers to move closer to urban areas. The main reason for this is urbanisation in China. More people in towns and cities means more middle schools in towns and cities accompanied by a gradual decrease of middle schools in rural areas. The Chinese urbanisation rate reached 53% in 2012. The urban population reached 712 million in 2012, increasing by 257.26 million, from 2000. However, the rural population decreased by 166 million in that period [9].

These population shifts require structural adjustments for schools. The greater urban population causes a shortage of existing school resources. New middle schools need to be constructed in urban areas to satisfy the increasing demand. However, the rural population is declining, leading to fewer students. In order to make reasonable use of resources, some schools in rural areas with insufficient students have been combined, resulting in fewer schools and so fewer information technology teachers.

Compared with urban middle schools, rural middle schools have relatively basic teaching conditions and rural life is harder. Therefore, many information technology teachers strive to enter the cities, resulting in the loss of information technology teachers from elsewhere [10]. Meanwhile, information technology teachers should undergo a regular professional assessment to ensure that unqualified teachers do not remain in the system, while the talented ones are attracted and engaged.

ACKNOWLEDGEMENTS

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