Research on the Necessity and Methods of Thinking Skill of High School Teachers in County Areas under the Background of Economic and Demographic Pressures

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Abstract: Economic development and population size are the two core issues of county development at present. These two factors have an important impact on the development of county high school education. Although previous studies have put forward some suggestions on the construction of high school, they rarely explain the problems existing in the development of county high school from the perspective of economy and population. This paper took the teachers at different ages in Dangyang No. 1 High School as the research object, aims to explore the impact of county economy and population development on thinking skill of teacher, and puts forward methods to improve thinking skill of teacher for future development. We used Multivariate Analysis of Variance (MANOVA) and Regression Analysis to explore methods that enable teachers to have sustainable thinking abilities through interviews and questionnaire surveys. Our results found that teachers in the under-30s group have stronger initial thinking skill, have more ideas in the face of economic and demographic pressure. Teachers in the 50-60 age group tend to solve problems with the help of colleagues and leaders rather than leaving the original living surroundings. Our results indicated that improving salary level and respecting the differences in teaching methods among teachers will significantly improve thinking skill of them. Our results are of great importance for mechanism exploration of influencing factor on the thinking skill of county high school teachers, and provide theoretical support for the better study quality in county high school.

Keywords: Thinking Skill; County High School Teacher; Economic Development; Population Size

1. Introduction

County high school is very important for high school education system, which is reflected in the fact that about 60% of high school students study in County high schools. It is worth noting that although the county high school is very important, the problem of teachers' resource allocation is becoming more and more prominent under the background of economic and population decline in recent years, which directly leads to the decline of teachers' thinking skill [1-2]. Many county regions in Hubei have historically relied on specific industries, such as coal and heavy manufacturing. Overcapacity in these sectors has led to inefficiencies and reduced profit margins, resulting in factory closures and layoffs[3]. This industrial stagnation has negatively impacted local economies. For example, The GDP of Dangyang in 2023 was 63.734 billion yuan, an increase of 877 million yuan compared with 2022, and the nominal growth rate of GDP was only 1.4%, which was the lowest in Yichang. In addition, the gap between the total GDP of Dangyang city in 2023 and Yiling District (78.22 billion yuan) is also expanding rapidly. A lack of investment in advanced technologies and innovation has hindered the ability of local businesses to compete in a rapidly changing marketplace, leading to economic stagnation. What's more, counties have seen a decline in agricultural productivity due to various factors, including soil degradation, water scarcity, and the inability to

modernize farming practices. As agricultural income diminishes, it contributes to broader economic challenges in these regions.

More importantly, the movement of young people from counties to urban centers in search of better job opportunities has significantly impacted population demographics. As the youth leave, these areas face a "brain drain" resulting in a shrinking workforce and an increasing proportion of elderly residents[4]. This demographic shift creates challenges for local economies, as older populations often have different needs and limited purchasing power, leading to decreased demand for goods and services, the loss in the number of school-age students in counties is becoming more frequent.

Previous studies showed that the influencing factors of thinking skill are also changing with the changes in the economic and demographic environment[5-6]. From the perspective of academic qualifications, the academic qualifications of high school teachers have gradually changed from junior college and undergraduate education in the past to undergraduate and graduate education today, which means that the age of first teaching is gradually increasing. From the perspective of family background, high school teachers have gradually changed from a large family population in the past to a family with only one or two children today, which means that the family structure of young teachers at this stage is relatively simple, and their education modes and admission channels are more diverse. From the perspective of teaching methods and tools, high school teachers have gradually changed from inner communication in the past to nationwide communication today. Nowadays, high schools can even rely on advanced electronic whiteboards, artificial intelligence and other ways to communicate with foreign high schools, which means that teachers have various channels to obtain information at this stage, increased the possibility of resignation.

2. Materials and Methods

2.1 Experimental Design

We selected teachers of different ages in Dangyang No. 1 high school as the research object. The experiment established in March 2025, was a randomized survey design with 5 age-treatments (i.e. $x<30$, $30<x<40$, $40<x<50$, $50<x<60$ and $x>60$), each treatment had teachers more than 15 individuals.

2.2 Measurements

To obtain representative data of teachers in each sampling age-treatments, we sent questionnaires to each teacher. The main content of the questionnaire has three points. The first point is whether they still have thinking skill at this stage, and explain the reasons; The second point is what factors affect thinking skill; The third point is whether it will change in the future.

After obtaining the data of thinking skill, we averaged the scores within the group and compared the scores of 5 age-treatments. In addition, we will make significance analysis and prediction for the influencing factors of different groups.

2.3 Data Analysis

Principal Component Analysis (PCA) was used to explore the most significant influencing factors of teachers' thinking skill at different age-treatments, and Non-metric Multidimensional Scaling (NMDS) was used to explore the similarity of influencing factors. NMDS was analyzed by Bray-Curtis dissimilarity matric using 'metaMDS' function from 'vegan' package in R. Sampling data were standardized through "Hellinger" transformation to reduce extreme bias of the most significant influencing factor to whole data. Generally, in the calculation of NMDS, the value of stress indicate the reliability of results, should not be greater than 0.2. Values >0.2 are generally considered poor, and plots were considered difficult to interpret. Traditional methods to calculate points require calculating the 'variance in performance measured in common garden or controlled experiments, but these methods are not suitable for different treatments, because there still have huge heterogeneity of properties and environments even if space scale is small, which result in countless points.

We use the Random Forest model (RF) to predict the possible changes of teachers' thinking skill. We used Multivariate Analysis

of Variance (MANOVA) and Regression Analysis to explore methods that enable teachers to have sustainable thinking abilities through interviews and questionnaire surveys. All data were using R software, ver. 4.4.3.

3. Results

The point of thinking skill ranges 0.304 (x>50) to 0.786 (x<30), and significantly, skill value of x<30 was bigger than x>50. The value of 30<x<40 was 0.568, The value of 40<x<50 was 0.449. The value of x>50 was 0.335. In addition, the key influencing factors of the four groups are also different. The influencing factor of group x<30 was the future possibility, The influencing factor of group 30<x<40 was the housing price, The influencing factor of group 40<x<50 was the children's education, The influencing factor of group x>50 was the Interpersonal relationship and career stability (Table 1).

Table 1. Thinking Skill Points for Different Age-Treatments

Treatment	Point	Significance[a]	Key factor
x<30	0.786	**	FP
30<x<40	0.568	*	HP
40<x<50	0.449	*	CE
50<x<60	0.335	*	IRCS
x>60	0.304	(·)	LH

[a]The significance were counted as quantified using average Jaccard's Dissimilarity. Significant results of ANOVA are shown in the third column of Table 1: **: $P < 0.01$; *: $P < 0.05$; (·): $P < 0.1$; NS: $P > 0.1$. Abbreviations: FP: Future Possibility; HP: Housing Price; CE: Children's Education; IRCS: Interpersonal Relationship and Career Stability; LH: Life Health.

4. Discussion

Our contrast study showed that a notable trend has emerged regarding the critical thinking capabilities of high school teachers as they age. It appears that teachers under 30 exhibit superior critical thinking skills compared to their older counterparts. This decline in cognitive flexibility and problem-solving ability can be attributed to various life circumstances and societal pressures unique to different age groups.

The group of teachers younger than 30 often showcases the strongest critical thinking skills. This phenomenon can be primarily attributed to the optimism associated with potential futures. Young teachers are generally at a stage where they are more open to exploring diverse methodologies and innovate pedagogical practices. The excitement of entering the profession of high school teacher and the freedom to envision various career paths stimulate their engagement and creativity, directly enhancing their critical thinking abilities. To capitalize on this youthful enthusiasm, schools should foster supportive environments that encourage experimentation and innovative practices, perhaps through mentorship programs linking younger teachers with more experienced staff.

As teachers enter their 30s, their critical thinking skills appear to diminish slightly, influenced predominantly by rising housing prices. The pressures of financial stability, such as affording a home and managing debt, can distract from cognitive engagement in their teaching roles. These pressures may lead to increased stress levels, thus reducing the cognitive bandwidth available for critical thinking[7]. Educational institutions can implement financial wellness programs to assist teachers in managing their finances. Workshops on budgeting, investment, and home buying could alleviate some financial pressures, allowing teachers to focus more on their professional development and teaching effectiveness[8].

For teachers in their 40s to 50s, the focus tends to shift towards concerns surrounding their children education. The pressure to guide their children successfully through school can lead to increased stress and time commitment, which detracts from their own professional growth and critical thinking. This dual burden may result in cognitive overload, reducing their capacity for critical analysis in educational settings. Schools could offer parental engagement programs that provide resources and support for teachers to balance their educational responsibilities with their roles as parents[9]. Additionally, flexible work arrangements could help alleviate some time-related stresses, thereby fostering improved critical thinking.

Those in the 50-60 age range are often keenly aware of the importance of interpersonal relationships and job security. The anxiety surrounding retirement and job stability can have a substantial impact on their critical thinking abilities. At this stage, many teachers

may prioritize maintaining the status quo over engaging in risk-taking or innovative practices due to fear of job loss or workplace conflict. Schools should create a culture of trust and open communication. Professional development opportunities should also focus on collaborative teaching strategies that promote teamwork among staff. Encouraging open forums for discussion could enhance their critical thinking by stimulating exchanges of varied perspectives[10].

Finally, those over the age of 60 tend to experience a further decline in critical thinking capabilities, primarily driven by health concerns. The fear of declining health and the potential impacts on their careers can lead to withdrawal from active engagement in educational dialogue and decision-making processes. County high schools should consider offering wellness programs focused on health management and stress reduction. Furthermore, implementing mentorship roles for older teachers could provide them with a sense of purpose while allowing them to share their knowledge and experience without the pressures of typical classroom responsibilities. Many county schools do not have access to quality wellness programs that are essential for older teachers to enhance their skills and stay updated with the latest educational trends. This limitation can lead to stagnation in teaching practices, ultimately affecting student learning outcomes.

In addition, we used RF to conduct simulation prediction regarding the enhancement of teachers' thinking abilities following the implementation of incentive measures. The prediction outcomes revealed that boosting teachers' salaries has a notable positive effect on teachers across all age groups. Conversely, enhancing student quality exhibits a more pronounced impact on young teachers under 30 years old. As for improving teachers' welfare benefits, it demonstrates a more significant effect among teachers over 50 years old.

5. Conclusion

Our study provides a better understanding and highlights the essential role of thinking ability in modulating high school teachers. The decline of critical thinking abilities among high school teachers as they age is influenced by a myriad of factors ranging from financial pressures to concerns surrounding family and health. It is essential for high schools to recognize these challenges and implement targeted support systems. By fostering an environment conducive to professional growth and mental well-being, schools can help educators of all ages enhance their critical thinking abilities, ultimately benefiting students and the broader educational landscape.

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