

Original Paper

The State and Development Guidelines for Science Teaching and Learning Management of Primary Schools in Guangdong, China

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Abstract

The purpose of this study is to investigate the current situation of science teaching management in primary schools in Guangdong Province, and to propose development guidelines. The sample group included 226 primary school teachers in Guangdong Province, and five of them were randomly interviewed. Questionnaires and interviews were used to collect data. According to the interview and the current development policy of primary school science teaching management in Guangdong Province, the future development of science discipline should pay attention to the concept of quality education, practical ability and scientific thinking training; Teachers should pay attention to the combination of systematic knowledge and science curriculum practice in teaching; At the same time, science teachers should innovate teaching methods, pay attention to personalized teaching and make full use of teaching resources.

Keywords

Curriculum system, Textbook construction, Teacher staff, Teaching style, Teaching resources, Science teaching and learning management

1. A Survey of Primary School Science Teaching Management Data in Guangdong Province

The selected data came from a sample group of 250 primary school teachers in Guangdong Province, including 226 valid questionnaires.

1.1 Basic Information Analysis

Table 1. Gender Analysis

Gender	Frequency	Scale
Male	69	30.53%
Female	157	69.47%
This topic is valid to fill in the number of people	226	

As shown in Table 1, the total number of participants in this survey was 250, and 226 valid questionnaires were collected. There were 69 male primary school teachers, accounting for 30.53%; There were 157 female primary school teachers, accounting for 69.47%. According to the analysis of the data, the primary school teachers who participated in the questionnaire were mainly female teachers, accounting for 69.47%, indicating that the data is in line with the characteristics of female teachers in primary school.

Table 2. Job Title Analysis

Gender	Frequency	Scale
School leaders	18	7.96%
Teacher	208	92.04%
This topic is valid to fill in the number of people	226	

As shown in Table 2, among the teachers who participated in the questionnaire survey, 18 were school leaders, accounting for 7.96%. There were 208 teachers, accounting for 92.04%. From the analysis of the data, it is concluded that the proportion of teachers participating in the questionnaire survey is high, which is in line with the characteristics of the normal school teacher team with a low proportion of school leaders and a high proportion of teachers.

1.2 Scale Problem Analysis

There are 5 rating levels in the scale, which represent:

4.50-5.00 express highest level

3.50-4.49 express high level

2.50-3.49 express medium level

1.50-2.49 express low level

1.00-1.49 express lowest level

The descriptive analysis and summary of all dimensions obtained in this questionnaire survey are shown in Table 3.

Table 3. Descriptive Analysis of Variables (N=226)

	Bedding plane	\bar{x}	S.D.	level	rank
1	Curriculum system	3.97	0.95	high	3
2	Textbook construction	3.93	0.96	high	4
3	Teacher staff	3.98	0.84	high	2
4	Teaching style	4.00	0.84	high	1
5	Teaching resources	3.77	0.98	high	5
	Total	3.93	0.91		

The questionnaire survey of five variables, including Curriculum system, Textbook construction, Teacher staff, Teaching style and Teaching resources, is shown in Table 3. As can be seen from the analysis in Table 3, the five variables involved in this questionnaire survey are all at a high level ($M=3.93$, $S.D.=0.91$). The levels of each variable in descending order are as follows: Teaching style ($M=4.00$, $S.D.=0.84$) > Teacher staff ($M=3.98$, $S.D.=0.84$) > Curriculum system ($M=3.97$, $S.D.=0.95$) > Textbook construction ($M=3.93$, $S.D.=0.96$) > Teaching resources ($M=3.77$, $S.D.=0.98$).

The following is a data case for each variable:

Table 4. Descriptive Analysis of Curriculum System (N=226)

1	Curriculum system	\bar{x}	S.D.	level	rank
1.1	The current science curriculum covers the full range of relevant knowledge and content areas.	4.06	0.93	high	2
1.2	The current science curriculum stimulates students' interest in science and their desire for exploration.	4.16	0.90	high	1
1.3	The current science curriculum is forward-looking and can lead students to the latest scientific developments.	4.08	0.92	high	3
1.4	For students' science projects the current selection, will meet the diverse needs of students.	4.03	0.93	high	4
1.5	The current science curriculum is difficult.	3.53	1.06	high	5
	Total	3.97	0.95	high	

As can be seen from the evaluation of the Curriculum system by primary school science teachers in Guangdong Province (Table 4), all the five questions are at a high level ($M=3.97$, $S.D.=0.946$), and the levels of each variable are as follows from high to low. Sorted here by title number): 1.2 ($M=4.16$, $S.D.=0.90$) > 1.1 ($M=4.06$, $S.D.=0.93$) > 1.3 ($M=4.08$, $S.D.=0.92$) > 1.4 ($M=4.03$, $S.D.=0.93$) > 1.5 ($M=3.53$, $S.D.=1.06$).

Table 5. Descriptive Analysis of Textbook Construction (N=226)

2	Textbook construction	\bar{x}	S.D.	level	rank
	The textbook contains enough examples and cases to				
2.1	help students better understand and apply scientific knowledge.	3.91	0.98	high	3
2.2	The textbooks can guide students to cultivate their scientific thinking and problem-solving ability.	4.07	0.89	high	1
	The textbook has content combined with students				
2.3	“real-life experiences to stimulate students” interest in learning.	4.04	0.91	high	2
	The textbook provides enough exercises and				
2.4	reference answers to help students consolidate and test their knowledge.	3.77	1.07	high	5
2.5	The current textbook has the content interest.	3.86	0.98	high	4
Total		3.93	0.96		

According to the evaluation of Textbook construction by primary school science teachers in Guangdong Province (Table 5), we can see that all the 5 questions are at a high level ($M=3.93$, $S.D.=0.96$), and the levels of each variable are in order from high to low (for the convenience of filling in, Sorted by title number here) :2.2 ($M=4.07$, $S.D.=0.89$) > 2.3 ($M=4.04$, $S.D.=0.91$) > 2.1 ($M=3.91$, $S.D.=0.98$) > 2.5 ($M=3.86$, $S.D.=0.98$) > 2.4 ($M=3.77$, $S.D.=1.07$).

Table 6. Descriptive Analysis of Teacher Staff (N=226)

3	Teacher staff	\bar{x}	S.D.	level	rank
	The current teachers of science teaching can explain				
3.1	scientific knowledge in class and interact with students effectively.	4.00	0.80	high	3
	The current teachers of science teaching can correct				
3.2	students’ mistakes in time and give them individual guidance and guidance.	4.09	0.78	high	1
	The current teachers of science teaching pay attention				
3.3	to cultivating students’ experimental operation skills and observation and analysis abilities.	4.05	0.78	high	2
	The school provides teachers of science teaching with				
3.4	sufficient professional development opportunities and training resources.	3.90	0.92	high	4

3.5	The current teachers of science teaching are satisfied with the school's overall professional quality.	3.87	0.94	high	5
Total		3.98	0.84		

As can be seen from the evaluation of primary school science teachers on Teacher staff in Guangdong Province (Table 6), all the five questions are at a high level ($M=3.98$, $S.D.=0.84$), and the levels of each variable are as follows in order from high to low. Sorted by title number here) :3.2 ($M=4.09$, $S.D.=0.78$) > 3.3 ($M=4.05$, $S.D.=0.78$) > 3.1 ($M=4.00$, $S.D.=0.80$) > 3.4 ($M=3.90$, $S.D.=0.92$) > 3.5 ($M=3.87$, $S.D.=0.94$).

Table 7. Descriptive Analysis of Teaching Style (N=226)

4	Teaching style	\bar{x}	S.D.	level	rank
4.1	The current teachers of science teaching adopt a variety of teaching methods in science classes to stimulate students' interest in learning.	3.96	0.84	high	5
4.2	The current teachers of science teaching flexibly adjust their teaching methods according to students' different learning characteristics and abilities.	4.00	0.80	high	3
4.3	The school encourages the teachers of science teaching to innovate their teaching methods to improve students' scientific literacy and practical ability.	4.00	0.89	high	4
4.4	The teachers of science the attention paid to cultivating students' inquiry spirit and problem-solving ability in the teaching process.	4.01	0.81	high	2
4.5	The teachers of science often use modern technology, such as multimedia and the Internet, to assist in teaching.	4.03	0.83	high	1
Total		4.00	0.84		

As can be seen from the evaluation of primary school science teachers on Teaching style in Guangdong Province (Table 7), all the five questions are at a high level ($M=4.00$, $S.D.=0.84$), and the levels of each variable are as follows in order from high to low. Sorted here by title number) :4.5 ($M=4.03$, $S.D.=0.83$) > 4.4 ($M=4.01$, $S.D.=0.81$) > 4.2 ($M=4.00$, $S.D.=0.80$) > 4.3 ($M=4.00$, $S.D.=0.89$) > 4.1 ($M=3.96$, $S.D.=0.84$).

Table 8. Descriptive Analysis of Teaching Resources (N=226)

5	Teaching resources	\bar{x}	S.D.	level	rank
5.1	The school provide sufficient laboratory equipment and materials to support students' practical exploration.	3.92	0.90	high	2
5.2	The school have a rich science library and electronic resources for students to consult and study.	3.66	1.04	high	4
5.3	The school have an online platform or online resource that facilitates students to obtain relevant scientific knowledge and materials on campus.	3.63	1.08	high	5
5.4	The school actively cooperate with external units to provide more resource support for teaching.	3.72	1.02	high	3
5.5	The school makes full use of existing resources to improve the quality and effectiveness of science teaching.	3.92	0.88	high	1
Total		3.77	0.98		

As can be seen from the evaluation of primary school science teachers on Teaching resources in Guangdong Province (Table 8), all the five questions are at a high level ($M=3.77$, $S.D.=0.98$), and the levels of each variable are as follows in order from high to low. Sorted by title number here) :5.5 ($M=3.92$, $S.D.=0.88$) > 5.1 ($M=3.92$, $S.D.=0.90$) > 5.4 ($M=3.72$, $S.D.=1.02$) > 5.2 ($M=3.66$, $S.D.=1.04$) > 5.3 ($M=3.63$, $S.D.=1.08$).

2. Development Methods of Primary School Science Teaching Management in Guangdong Province, China

From the analysis of the interview content, the primary school teachers who participated in the interview believed that the current primary school science curriculum system played a good vertical transition role and could reasonably pave the way for students' learning of science subjects in junior middle school.

In terms of textbook construction, the construction of primary school science teaching materials should conform to reality, strengthen the selection and organization of teaching materials, and improve teachers' teaching materials. Science teaching materials should be compiled according to the age characteristics of students of different ages, cognitive laws and the latest trend of scientific development.

In terms of teacher staff, the evaluation and evaluation of science teachers' skills should be strengthened to promote teachers to consciously and actively improve their teaching skills, and it is recommended to establish a teacher training program for primary school science teachers.

In terms of teaching style, teachers should first give students enough time to rehearse and do some relevant homework; In the classroom, science teachers should use a variety of teaching methods to stimulate students' enthusiasm for learning.

In terms of teaching resources, due to the different degree of perfection of teaching hardware and software in different regions, the utilization rate of teaching hardware and software facilities in some regions is not high. The interviewed teachers believe that schools should strengthen the exchange and cooperation of science and education resources, and strengthen the integration of science and education resources (Fang, 2022).

Through the questionnaire of primary school teachers, the research finds that the current management status of primary school science subjects in Guangdong Province is reasonable.

It is concluded that science education plays an important role in schools, and should pay attention to the cultivation of students' scientific thinking, scientific literacy and scientific responsibility. The primary school science curriculum should be set up in accordance with the Compulsory Education Science Curriculum Standards, schools need to recruit excellent science education teachers, and ensure the normal opening of science courses. The improvement of teachers' scientific literacy and teaching ability needs to be achieved through training and academic exchange. Schools should also pay attention to the construction of teaching resources and provide modern educational facilities such as classrooms, laboratories and libraries. Governments should provide policy and financial support to promote the development of science education. To sum up, schools need to strengthen science education in the aspects of curriculum system, textbook construction, teacher staff and teaching resources, so as to improve teaching quality and the cultivation of students' comprehensive ability.

3. Current Situation of Primary School Science Teaching Management in Guangdong, China

According to the questionnaire, the study found that participating elementary school teachers gave their school science subjects. Curriculum system, Textbook construction, Teacher staff, Teaching style, The average values of the five variables, including Teaching resources, are all at a high level ($M=3.93$, $S.D.=0.91$), which indicates that the teachers participating in the questionnaire believe that their school's curriculum system, textbook construction, teaching staff, teaching style and teaching resources are reasonable. The levels of each variable in descending order are: Teaching style ($M=4.00$, $S.D.=0.84$) > Teacher staff ($M=3.98$, $S.D.=0.84$) > Curriculum system ($M=3.97$, $S.D.=0.95$) > Textbook construction ($M=3.93$, $S.D.=0.96$) > Teaching resources ($M=3.77$, $S.D.=0.98$). Therefore, teachers believe that for the current status of science teaching management in primary schools in Guangdong Province, the importance of these five variables in descending order is as follows: Teaching style > Teacher staff > Curriculum system > Textbook construction > Teaching resources.

To sum up, 226 primary school teachers who participated in the questionnaire believe that the current science curriculum system and textbook construction in their schools are reasonable, the teaching resources given by the schools are reasonable, the science teachers selected by the schools are

reasonable, and the teaching style of science teachers is appropriate. Therefore, through the distribution of questionnaires to primary school teachers, the research finds that the current management status of primary school science subjects in Guangdong Province is relatively reasonable.

4. Analysis of Primary School Science Teaching Management Strategies in Guangdong Province, China

The above five variables (Curriculum system, Textbook construction, Teacher staff, Teaching style, The conclusion of Teaching resources provides a guiding direction for the optimization of science courses in primary schools.

This shows that in the construction of Curriculum system, we can build a systematic and complete curriculum system, including vertical and horizontal hierarchical classification structure. Secondly, it pays attention to diversity and connection, combining natural science knowledge with other disciplines to realize the integration of interdisciplinary and symbiotic knowledge. We should also pay attention to the balance of the course structure, simplify the course content, and emphasize the integration and cross between disciplines.

In terms of Textbook construction, a professional team should be selected to compile high-quality textbooks, highlight The Times and regional characteristics of the textbook content, and adapt to the development and cultural background of students (Yuan & Zhao, 2019).

In terms of Teacher staff, the structural and functional deficiencies of teachers should be solved, and the quality and ability of teachers should be improved by training more science teachers and strengthening teacher training.

In terms of Teaching style, we should adopt a variety of teaching methods, such as on-line mixed teaching, problem-oriented teaching, inquiry teaching, etc., to cultivate students' scientific method and scientific spirit.

In terms of Teaching resources, there should be a unified view of science curriculum related resources, use information technology to realize the co-construction and sharing of resources, and strengthen the connection between schools, families and communities to form a science education community.

The above suggestions aim to improve the quality and effect of primary school science education, and cultivate students' scientific literacy and scientific inquiry ability.

There are suggestions for further research:

1. Strengthen high-level policy and system support

China's science education started late, but since the reform and opening up, science education has made great progress. From the perspective of policy issuing agencies, the state attaches great importance to science education. From the "Several Opinions on Strengthening the Popularization of Science and Technology" issued by the CPC Central Committee and The State Council in 1994 to the Outline of the National Science Quality Action Plan (2021-2035) issued by The State Council in 2021, China has issued few policy documents on science education, the number is small, and the scope and depth of

science education are not enough. China should focus on policy, strengthen the top-level system design, provide relevant policy and institutional guarantee for the smooth development of science education, and clearly stipulate the implementation theme, responsibility and implementation guarantee of science education in relevant laws and regulations such as the Education Law and the Compulsory Education Law, so as to promote the implementation of science education. The local government should also improve the relevant local laws and regulations, policies and regulations according to the superior laws, formulate the implementation measures for science education that are suitable for the actual situation of the school, take practical and effective measures, grasp the reality, and achieve results.

2. Actively carry out informal science education

Science learning in the environment of daily life is not limited by time and space, such as scientific discussion, reading science books, surfing the Internet, visiting science exhibitions, etc. Kurt Squier and Nathan Patterson of the Center for Educational Research at the University of Wisconsin have studied informal science education in terms of the context of everyday science education. They cite characteristics of everyday science education environments and facilities as described by the National Research Council (NRC) and argue that characteristics of this educational environment can increase people's interest in science and promote recognition of science. Various scientific and technological venues, such as museums, botanical gardens, zoos, aquariums, and others, are considered a designable environment for informal scientific learning. They can take advantage of their resources to disseminate scientific knowledge, scientific methods, scientific ideas and scientific spirit to people through exhibitions, displays, interactions, teaching, exploration, experiments, production and other ways.

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