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The Effect of Multiple Intelligences Teaching on Biology Learning of High School Students

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Abstract: *Theory of multiple intelligences (MI theory) is a new theory of human intelligence structure, which provides theoretical guidance for teaching optimization. This study aims to understand the effect of multiple intelligences teaching on the biological multiple intelligences of high school students. In this quasi-experimental study, the experimental group received instruction based on MI theory and the control group received traditional lectures. The formal multiple intelligences assessment scale [youth version] was used for investigation, comparing and analyzing the difference of multiple intelligences level between experimental group and control group after teaching by T test. The data shows that after the implementation of multiple intelligences teaching, the students in the experimental group are significantly better than the control group in terms of multiple intelligences, indicating that the teaching of metaintelligence has a positive effect on the comprehensive quality of students. Therefore, in the future junior high school biology teaching, the multiple intelligence teaching mode should be applied to tap the potential of each student and achieve better teaching results.*

Keywords: *Theory of multiple intelligences; Middle school student; Biology Learning Impact*

1. Introduction

1.1. Research background

If education is to remain invincible in the current changing economic landscape, it must highlight its own characteristics. Many studies believe that among the many factors that determine whether a person will become a talent in the future, intelligence factors only account for 20%, while non intelligence factors account for 80%. Therefore, in teaching, the success of many students' learning depends not only on their intellectual factors, but also on non intellectual factors. However, non intellectual factors are often ignored by many teachers.

Theory of multiple intelligences (MI theory) is a brand-new theory of human intelligence structure, emphasizing the transformation of previous educational thinking, encouraging educators to look at each student with a developmental perspective, discover their different intelligence advantages, and cultivate the outstanding intelligence of each student in the process of teaching[1]. MI theory contains a lot of content, such as verbal intelligence, mathematical logic functions, visual space intelligence, interpersonal communication, self-introspection intelligence, etc. Using MI theory can clarify the weak state of students' intelligence development, so as to carry out targeted improvemen[2].

Therefore, in the process of teaching, it is necessary to respect the development differences of students and advocate individualized development, which will be an important educational direction in the future. These requirements are very consistent with the theory of multiple intelligences. Therefore, under the guidance of this theory, discussing the impact of multiple intelligences teaching on middle school students' biological learning is of great value for guiding the improvement of teaching models.

1.2. Multiple Intelligence Theory

According to Piaget's cognitive theory and the traditional view of intelligence, intelligence is a kind of ability with language ability and mathematical logic ability as the core and existing in an integrated way. Gardner felt that "this fixed concept emphasizes the existence and importance of brain power - it is a kind of ability, which has different names: reason, intelligence or the use of the brain". But this traditional intelligence theory is too narrow, and it ignores other aspects that are equally important to

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human development, such as music, space perception, body movements and interpersonal communication. The intelligence test and examination based on the traditional concept of intelligence also focus on language expression and mathematical inference, which cannot fully reflect the students' ability. This kind of examination has a good predictability for students' academic performance, but it is powerless to predict the situation of students after graduation, and even their future potential and performance. Therefore, the coverage of the traditional intelligence theory is far less extensive than that of the real intelligence in the practical world.

In the current era, the society has higher and higher requirements for talents, and innovative talents are the most needed in the current society. In addition, the state also encourages the cultivation of students' comprehensive ability in education. Many schools incorporate this requirement into educational assessment and have special teaching strategies to cultivate students' comprehensive ability. At the same time, it should be noted that the promotion of comprehensive quality is not the responsibility of teachers of a certain discipline, but should be the joint efforts of all teachers and all disciplines. The requirement of comprehensive ability reflects the high requirements for students. In teaching, we cannot only attach importance to imparting knowledge to students.

Therefore, it is very necessary to optimize the classroom. In this context, the teaching of biology should also respond positively. Using the theory of multiple intelligences to guide the teaching can play a role in cultivating students' comprehensive abilities, because using this concept as a guide will pay more attention to the cultivation of students' various key abilities in teaching, such as mathematical logic, interpersonal communication, self-examination, etc., which are closely related to comprehensive abilities. Therefore, it is very necessary to carry out the teaching of multiple intelligences in biology.

2. Research methods

2.1. Research objects

The subjects of this experiment are 2 classes of grade 10 in middle school A, with 30 students in each class. The average scores of biology in the two classes were basically the same, and the teaching progress was the same. The experimental group received teaching based on MI theory, and the control group received traditional lectures. The study started in May 2022 and ended in July 2022 for a total of 2 months.

2.2. Research instrument

The study uses the formal multiple intelligences assessment scale [youth version] to judge students' multiple intelligences, so as to evaluate and analyze students' learning. Since a mature questionnaire is used, the reliability and validity of the questionnaire have been well verified, and repeated verification is not required. Then, the teaching results of the two classes are evaluated, and the results are analyzed and compared to verify the effectiveness of the experiment.

2.3. Experimental process

In this experiment, Class 1, Grade 10, Class 2, Grade 10 in Middle School A was used as the control group. The thinking of investigating the results of multiple intelligences teaching adopted in the research refers to the achievements in relevant fields[3], sets the goal and process of multiple intelligences teaching for each teaching, and comprehensively improves the subject ability and intelligence of the tested students. In the specific teaching process, according to the existing grade textbooks, integrate the teaching methods of multiple intelligence research, set the teaching objectives and teaching strategies for each teaching, and carry out the education and teaching for them in an orderly manner for two months.

3. Research results and analysis

After completing the teaching, the formal multiple intelligences assessment scale [youth version] was used to conduct Gardner's multiple intelligences assessment for the experimental group and the control group respectively. The specific results are shown in Table 1.

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Table 1: Comparison of multiple intelligence levels between the experimental group and the control group.

	Average	Standard Deviation
Test Group	74.382	13.921
Control Group	71.273	15.579
T	3.037	
P	0.003	

It can be seen from Table 1 that the average scores of the experimental group and the control group are 74.38 and 71.27 respectively (out of 100). After the independent sample T test, P=0.003＜0.05, indicating that the teaching of multiple intelligences can improve the multiple intelligences of students. Comparing the average scores of the experimental group and the control group, it can be found that the experimental group is significantly higher than the control group, which shows that the teaching of multiple intelligences has a very positive effect and value on the biological learning of middle school students.

4. Conclusion

According to the theory of multiple intelligences, intelligence is multiple. According to the experimental results and statistical analysis data, it is found that the class biology teaching result using the multi intelligence teaching mode is better, which proves that the teaching method under the guidance of the multi intelligence theory has a positive promoting significance for biology teaching and can improve the students' multi intelligence level. According to the actual teaching situation, under the multi intelligence teaching mode, students' thinking and ability have been improved, and they can view biological knowledge more pluralistically. At the same time, the multiple intelligence teaching model more respects the subjectivity of students, and students' interest in learning has also been further improved in the teaching process.

However, according to the existing survey results, the improvement effect of multiple intelligence teaching mode on students' different intelligences is not clear, which is also an important content that needs to be further improved in the follow-up research. Next, the research will explore the specific effects of multiple intelligence teaching methods, so as to provide help and support for the optimization of methods and the growth of students with different characteristics.

5. Biological Multiple Intelligence Teaching Strategy

Using the theory of multiple intelligences to guide biology teaching should be based on the actual classroom, because the classroom is the main position for teaching. Therefore, we should put this idea throughout the whole teaching process.

5.1. Focus on the differences of students' ontology intelligence

For everyone, at the time of birth, there is already a foundation for developing various intelligences, which is from the perspective of genetics, and has the highest level of intelligence. However, in real life, it is unlikely that everyone's intelligence can approach this highest value. There is no doubt that everyone has their own foundation for the development of multiple intelligences. In the process of actual teaching, if students can be provided with conditions that can promote their intellectual development, the environment can play a good role. From another perspective, if students lack the conditions for intelligent development in the learning process, the probability of their physiological potential being stimulated will be relatively small.

In the teaching of biological multiple intelligences, we should make this point clear, and start from this point to provide students with a diversified learning environment, so as to better implement the stimulation of multiple intelligences. With the continuous development of computer technology, teachers can be well assisted to create a multi intelligence environment for students and promote their intelligence development. Therefore, in biology teaching, it is more necessary to give full play to the unique advantages of this discipline, provide students with diversified learning tasks in the classroom, and comprehensively consider the differences in their existing intelligence levels.

In addition, diversified learning tasks are also needed to trigger the development of students'

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abilities in different intelligent fields, so that students can enjoy intelligent fairness. For example, when teaching, you can first ask students some questions, so that students can think and express, and develop their speech intelligence.

5.2. Diversified teaching objectives and contents

Teaching objectives and content are two key parts of the classroom. Before teaching, we should formulate clear objectives and scientifically arrange the content, and then choose appropriate activities to present these contents in the classroom. Based on the theory of multiple intelligence teaching, individualized teaching is needed in biology teaching. Pay more attention to all students and their superior intelligence.

Under the guidance of this concept, when formulating teaching objectives, we need to start from two aspects. On the one hand, we should pay attention to the teaching objectives, which aspects of multiple intelligences are reflected. In the specific classroom, what kind of intelligence should students develop and what kind of intelligence they need to use in the learning process. On the other hand, teachers need to be very clear about different aspects of multiple intelligences, and can describe specific teaching goals in different intelligent ways. In the middle school stage, the pressure of students' entrance examination has always existed. In teaching, it is found that many cases are that students cannot safely understand the meaning of the question, resulting in succession errors and deviations. Therefore, in teaching practice, the development of students' language intelligence is more and more important.

Taking biological experiment teaching as an example, in teaching, we can't only focus on students' practical operation ability, because from the actual teaching, some students can only operate, but can't express the operation process in their own language. The tools and task bar used in the operation process cannot be described clearly in words. Therefore, in this part of teaching, a very important teaching goal is to develop students' speech intelligence. For example, in the process of teaching, students can ask more questions so that they can answer questions as clearly as possible.

5.3. Diversified teaching situations

When students are learning, their emotions will greatly affect the learning effect, which is very clear to most educators. Therefore, in the process of teaching, more people will use the method of creating teaching situations to transfer content knowledge to students. Under the requirements of multi intelligence teaching, the creation of situations in biology teaching should also adhere to the principle of diversification. For example, in biology teaching, students will be provided with some situations related to their social and cultural background. Students will be more active in learning, and they will have a cordial sense of these knowledge. The application of teaching situation is to play an important role in cultivating students' multiple intelligences, set up specific situations and atmosphere for students, and finally achieve the improvement of teaching effect.

Biology has a natural soil for creating situations. For example, the knowledge of this discipline is not all presented in words. Therefore, for students, they will have a variety of teaching situations and a broader learning platform to let them play their intelligence in this process. It can also combine different intelligences and be more active in learning. In this course, making full use of network resources to realize the construction of teaching situation is a very critical point, which is also an advantage it has. Therefore, in the process of teaching, teachers can make full use of this advantage to build a situation, provide students with a learning platform, enhance students' learning ability, and stimulate students' intelligence and potential in this process.

5.4. Shared learning between teachers and students

The new curriculum concept requires that education and teaching activities focus on the interaction between teachers and students to create an efficient classroom, which is also true in biology teaching. Efficient classroom should be a place for teachers and students to achieve wisdom growth together. Therefore, in the teaching of biological multiple intelligence, teachers and students should also pay attention to learning together, which is also an important method to develop students' interpersonal intelligence.

In the process of collaborative learning between teachers and students, on the one hand, it can cultivate students' communication, but also enable them to maximize their interpersonal potential. On

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the other hand, it can enable students to help each other and achieve intelligent complementarity. In this process, we can also carry out various learning activities in the form of groups, so that students can combine voluntarily and guide them to conduct heterogeneous grouping

In the process of the development of interpersonal intelligence, it is necessary to understand that the core is that students need to know the difference between themselves and others. Therefore, when teaching, students can be provided with specific learning tasks, so that they can cooperate to complete the process, so that they can analyze their own and others' abilities and what they are good at. On this basis, we should divide the work and grasp the progress speed of the overall learning activities. In this process, we can not only develop students' interpersonal intelligence, but also their reflective intelligence.

5.5. Diversification of teaching evaluation

In the process of teaching, evaluation is a very critical part. By evaluating students, teachers can constantly review the classroom content and understand the actual learning situation of students. As for students, they can also better understand their own learning situation through the teacher's evaluation. Therefore, teaching evaluation can play a very important role in guiding both teachers and students. When teaching evaluation is carried out, corresponding tests will be carried out first, some exercises will be set as classroom tests, and standardized test papers will be used as the evaluation mechanism, and students' test results will be used as the basis for short-term staged evaluation. It can also be seen from this evaluation method that the score of the test paper has become a standard to judge the quality of students' learning, and also the only standard. This evaluation method is contrary to the theory of multiple intelligence teaching. Because under such evaluation criteria, students will pay more attention to their academic achievements in the process of learning, rather than the development of their own intelligence in all aspects. For teachers, under the requirements of this evaluation standard, they can only present the information content in the textbooks to students in the teaching process, and can't pay attention to the students' personality differences. Therefore, we must improve teaching evaluation, adhere to the principle of diversification, and evaluate students from multiple perspectives.

For example, in the process of teaching, students' open answers can be regarded as a key content of evaluation. This is a comprehensive and multi-level evaluation of students. Taking an open answer as a key point can help students reflect constantly, look at their own open answers more comprehensively, and then cultivate their reflective intelligence. Moreover, such self-evaluation can also well develop students' speech intelligence.

In addition, students can evaluate each other, which can also make teaching evaluation more scientific and diversified. It should be noted that the evaluation of students' open answers should not be limited to the completion of the open answers, but should be run through the overall learning activities. Students can complete the open answers while obtaining the evaluation, which can also encourage them to constantly review their open answers, make adjustments, and cultivate students' reflective intelligence.

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