Analysis of the Effect on Grouping Teaching at Different Levels in the Standardized Training of Residents

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Abstract: Purpose: *Understand what kind of effect can be achieved by grouping teaching at different levels in the standardized training of residents.* ***Method:*** *A total of 96 residents who received standardized training at the First Affiliated Hospital of Nanjing Medical University from September 2016 to July 2022 were selected. They were divided into two groups. The test group (i.e. Group A) including 50 candidates who received teaching at different levels; and the control group (i.e., group B) had a total of 46 candidates who received traditional task-driven teaching. Three methods (questionnaires, theoretical tests and practical skills assessments) are used to assess the effectiveness of the two teaching methods described above.* ***Results:*** *(1) The questionnaire results showed that the performance of residents in Group A was significantly better than that of Group B in many aspects (Satisfaction with the profession(p<0.001), Interest in the course(p=0.001), Mastery of professional knowledge and skills(p<0.001), Heuristic thinking ability (p <0.001), The ability to conduct rigorous and thorough comprehensive analysis(p<0.001)). (2) The theoretical test results showed that Group A's performance was significantly better than that of Group B (p<0.001). (3) The results of the practical skills assessment showed that Group A's performance was significantly better than that of Group B (p<0.001).* ***Conclusion:*** *Positive effects (such as a significant increase in learning interest and learning ability) can be achieved by grouping teaching at different levels in the standardized training of resident physicians.*

Keywords: *Subjective status, Teaching at different levels, Standardized training for resident physicians*

1. Introduction

Proposed by Benjamin Bloom, the "theory of mastery learning" promotes that if given enough time and scientific teaching methods, all students should be able to master what they need to learn through their own hard work. In order to keep students' attention and achieve teaching goals, multi-level teaching should be adopted according to the psychological characteristics, knowledge mastery and interests of different students. As the Benjamin Bloom suggests, teaching at different levels refers to the scientific division of students into different levels according to their knowledge/ability level and potential, and the use of different teaching methods for students at different levels. By choosing the right teaching strategy, this approach can help students at different level achieve the best possible improvement and growth [1]. The "teaching optimization theory" proposed by the famous Soviet educator Babansky refers to the selection and implementation of a teaching program that enables teachers and students to obtain the best teaching effects with the least time and effort.

The above optimization presupposes that all the necessary knowledge and skills can be fully mastered, because a magnificent building could be designed and built only with a wealth of building materials. In order to achieve optimization, teachers should have mastered various pedagogical and psychological knowledge and skills, dialectical and systematic thinking. It's helpful for them to comprehensively, systematically and meticulously teach students, make comprehensive planning for classroom teaching tasks, teaching contents and make flexible use of a variety of teaching methods [2].

In terms of classroom teaching, both teaching at different levels and task-driven methods can make (although in different manners) the training of residents productive. For residents, achieving all-round quality development through learning is the ultimate goal. Sukhomlinsky attaches particular importance to the spiritual growth of students and believes that the richness of the inner mind is an extremely important sign of the all-round development of a person [3]. By implementing teaching at different levels,

we can allow residents to enjoy learning, acquire new knowledge and improve themselves.

2. Objects and Methods

(1) Subjects of study

Based on clinical data, we selected 96 residents who received standardized training at the First Affiliated Hospital of Nanjing Medical University from September 2016 to July 2022. They were divided into groups (A) and (B), which respectively contained 50 and 46 people. There was no significant difference in the number of years of training between the two groups (1.9 years for group A, 1.8 years for group B, p=0.525). A total of 96 questionnaires were distributed, all of which were recovered and considered valid.

(2) Implementation of the educational program

Teaching at different levels refers to the use of targeted multi-level teaching for students with obvious differences in a knowledge base, intellectual factors and non-intellectual factors, which could achieve different levels of teaching objectives. Although the cost of bearing a workload several times higher than that of traditional teaching methods, teachers can gain experience in organizational control and adaptability by effectively organizing the teaching, flexibly designing teaching strategies at different levels. In fact, the aim of this method is to create as many favorable conditions as possible and eliminate various unfavorable conditions, so as to develop the potential of students in a hierarchical manner. It is not only a teaching method but also a teaching philosophy and mindset, which is very suitable for flexible application in the standardized training of resident physicians [4]. The main procedures and steps for implementing teaching at different levels are as follows:

The first step is to divide residents into groups: In order to make the teaching more targeted, we designed a questionnaire based on three major items and seven sub-items including the residents' knowledge base, thinking ability and program requirements. After analyzing the collected questionnaires, we divided the residents into two groups: Groups I and II. Group I contains students with average questionnaire scores, who received teaching conducted according to basic program requirements; while Group II contains students with good questionnaire scores, who received teaching conducted at a level slightly above basic program requirements; the groups were not fixed and could be adjusted at any time according to the residents' learning performance.

The second step is level-based lesson preparation: Different levels of teaching objectives should be set according to the teaching plan, teaching materials and the specific situation of the students. Specifically, we required residents in Group I to meet basic requirements in terms of knowledge, skills and emotion control; and Group II was required to be able to skillfully apply the knowledge learned to analyze problems on the basis of meeting the basic requirements. Students at different levels can choose different goals according to their own needs and starting points, thereby increasing learning enthusiasm and reducing the difficulty of learning.

The third step is level-based teaching: In this step, we should pay attention to the appropriate selection of the starting point and teaching arrangements (including introduction, review, new lesson teaching, summary, homework assignment, etc.) according to the level of residents, which could reduce the difficulty of learning. Following the teaching tenet of "centering around students, teachers taking the lead, focusing on training and targeting at developing ability", we formulated different teaching programs for Group I and Group II.

The fourth step is level-based tutoring: It refers to taking different approaches to guide residents at different levels. Following the principle of "teaching according to aptitude", through homework tutoring, the establishment of extracurricular cooperative research groups and other necessary means, teachers can give more support for the students to promote the students transformation from low-level to high-level, and in turn develop their own strengths. Teachers' level-based tutoring for residents is mainly reflected in three aspects: consolidating the original knowledge system, reviewing the newly learned knowledge, and learning how to comprehensively apply the old and new knowledge and discover their connection with subsequent knowledge.

The fifth step is level-based evaluation: It includes theoretical tests and practical skills assessments. From a unified proposition, two sets of exams (I and II) were prepared. For those with good scores, teachers should acknowledge their performance while helping them to recognize their shortcomings and encouraging them to seek further improvement; for medium-level students, more encouragement should

be given while helping them clarify how they can improve their performance; for underperforming students, it's significant to help them establish confidence.

The task-driven approach belongs to traditional pedagogy. However, unlike more traditional pedagogy that focuses on imparting knowledge, this method focuses more on problem-solving, task completion and multi-dimensional interaction; through transforming reproducible teaching into inquiry-based learning, this approach can also encourage students to propose solutions to problems based on their own understanding, shared knowledge and personal experience. In accordance with the requirements of the teaching plan, the teacher should identify situational cases, teaching objectives and specific teaching tasks successively. After assigning tasks to students, the teacher should not give a lecture immediately but guide the students to think independently and analyze carefully, which helps them complete the learning tasks better [5]. The main procedures and steps for implementing this method are as follows:

The first step is scenario creation: "scenario" here refers to a learning scenario that reflects the real teaching contents and objectives. Approaching real-world learning situations with assigned tasks can effectively stimulate students' associative thinking that connects new knowledge and skills with their original knowledge systems. Through the "comparison table method", the students can record new knowledge and skills learned in the table 1.

The second step is to determine the problem to be solved: It refers to the selection of a real-world problem that is closely related to the teaching goal and needs to be solved immediately by the student under the created scenario. As core contents, the tasks assigned for solving the problem increase students' motivation, encouraging them to use the knowledge and experience they already have to analyze the problem and solve it. This help students achieve the connection between old and new knowledge and the construction of new knowledge systems.

The third step is to analyze the problem: For the problem that needs to be solved, students need to complete the design and correction of solutions by collecting information and communicating with peers in the same group. If students encounter difficulties in this process, the teacher can provide relevant tips to help them find a solution.

The fourth step is self-evaluation and mutual evaluation: The evaluation of learning effectiveness includes self-assessment and mutual evaluation, the former includes the process and results of problem-solving, as well as the extent to which knowledge is mastered; the latter is more important because it embodies what other people think about your personal abilities and spirit of cooperation.

(3) Evaluation of teaching effectiveness

Teaching effectiveness evaluation is divided into two parts: residents' self-assessment and ability test. Among them, the self-assessment results came from an anonymous survey of the 2 groups, which included three major items: knowledge base, thinking ability and program requirements. While the ability test includes two major items: theoretical knowledge and clinical practice. The results of both subjective and objective assessments were used for analysis. The theoretical test is a closed-book exam with a maximum score of 100, and questions are prepared based on teaching content. The clinical operation skill assessment includes four items (action compliance, action fluency, emergency handling, and random Q&A), each with a maximum score of 25, and senior chief physicians were invited to give scores.

(4) Statistical method

SPSS 20. 0 was used to analyze evaluation data. The subjective evaluations are expressed by rate, and measured via χ^2 test; while objective test scores are expressed in $(x\pm s)$, and measured via t-test. $P < 0. 05$ indicates that the difference is statistically significant.

3. Results

(1) The survey results are shown in Table 1.

Table 1: Survey results of the two groups

	Item	Group A (n=50) N	Group B (n=46) N	P
Knowledge base	Satisfaction with the profession	36	8	<0.001
	Interest in the course	18	8	0.001
	Mastery of professional knowledge and skills	48	16	<0.001
Thinking ability	Heuristic thinking ability	46	12	<0.001
	The ability to conduct a rigorous and thorough comprehensive analysis	48	8	<0.001
Program requirements	Basic requirements	32	26	0.139
	Slightly above the basic requirements	26	12	0.09

(2) Theoretical examination and operational skills assessment

The subjective and objective assessment scores of Group A are higher than those of Group B. In the theoretical examination, Group A obtained an average score of 90.1, which was significantly higher than that of Group B (77.89) (P<0.001); in operational skills assessment, Group A obtained an average score of 87.88, also significantly higher than that of Group B (76.14) (P<0.001).

Table 2: Theoretical and practical exam scores of both groups

Group	Number of persons	Theory test score	Practice test score
A	50	90.10±2.00	87.88±3.82
B	46	77.89±6.81	76.14±3.79
P		<0.01	<0.01

4. Discussion

The implementation of teaching at different levels eliminates the situation in which some residents become idle after completing assignments in class, and gives all residents a sense of accomplishment, thus enhancing their confidence in learning. At the same time, this teaching method also contributes to the quality education that has long been advocated. The teaching modes designed according to the specific conditions of residents can help improve their overall quality. After feeling fully respected, residents are more willing to participate in teaching interactions, which is beneficial to forming a virtuous circle and continuously improving the quality of professional education [6].

Take the effect evaluation of teaching at different levels as an example, the traditional "score first and only" evaluation method is too simple and inflexible, and a better way is to tell the student the same as Teacher did: "Your grade this time is not bad, but I believe that there are some mistakes that can be avoided. I believe that, as long as you work harder, you will definitely be able to achieve better grades, and you must believe in yourself." [7]. The evaluation of residents should have the effect of positive motivation. For residents with different starting points and at different levels, different evaluation methods should be adopted so that they can correctly recognize their problems in learning. For example, for good students, teachers should acknowledge their performance while helping them to recognize their shortcomings and encouraging them to seek further improvement; for medium-level students, more encouragement should be given while helping them clarify how they can improve their grades; for underperforming students, it's recommended to highlight their strengths and acknowledge any little progress, which could help them eliminate low self-abasement. Some of the residents in the A-II group who had been underperforming have greatly improved their self-confidence through stratified education.

Teaching at different levels could be difficult to implement. Due to the influence of traditional thinking, it's easy to see this method as differential treatment of students, resulting in damage to students' self-esteem and even to the healthy development of personality. For example, some residents in Group A-II felt that they should be good enough for getting into Group I, and as a result, became rather reluctant to cooperate with related activities.

Judging by the performance of Group B, the traditional task-driven approach can also encourage residents to propose solutions to problems based on their own understanding, shared knowledge and personal experience. However, there is still some prospects for improvement. For example, some difficulties are had in controlling the teaching progress and the degree of exploration, and in classroom management and evaluating teaching effects. It is possible that some residents in this group might had

been inactive and hiding behind others, causing teachers to misjudge the overall performance of students and the teaching effects.

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