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The Importance of College Students' Innovative Entrepreneurial Training Plan Program in Cultivation of Medical Undergraduates' Scientific Research Literacy

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Abstract

Objective: To explore the roles of College Students' Innovative Entrepreneurial Training Plan Program (SIETP) on improving scientific research ability and clarifying career planning of medical students. **Methods:** Questionnaire survey was used to investigate 200 undergraduates in different majors of Health Science Center of Yangtze University. The questionnaire consists of three parts: the status of respondents participating in scientific research, the distribution of students participating in scientific research activities in different majors and grades, the effects of SIETP on medical students' scientific research ability and career planning. **Results:** The survey showed that 87% of students were willing to participate in scientific research. 65% of students didn't familiar with scientific research. Of the 200 students, only 44 (22%) had participated in scientific research projects, among which clinical medicine students account for the largest proportion, 61.4%. The proportion of senior students participating in scientific research activities was higher than that of junior students, and the proportion of male students was higher than female students. SIETP could significantly improve scientific research awareness, literature consulting ability, project design ability, data analysis and processing ability of students ($P < 0.05$). **Conclusion:** The medical students in our university had insufficient understanding and low participation in scientific research. SIETP could help students improve their scientific research literacy, it has a good guiding role for medical students' future career planning.

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Keywords

Medical Students, College Students' Innovative Entrepreneurial Training Plan Program (SIETP), Scientific Research Ability

1. Introduction

College Students' Innovative Entrepreneurial Training Plan Program (SIETP) is the specific content of national innovation and entrepreneurship training program for college students implemented by the Ministry of Education during the 12th Five-Year Plan period. It aims to promote colleges and universities to change educational ideas, reform the personnel training mode, strengthen the innovation and entrepreneurship ability of college students, and cultivate high-level innovative talents to meet the needs of country (Lv et al., 2021). With the rapid development of modern science technology in the field of medicine, medical education should change from focusing only on traditional theoretical teaching to combining theory with scientific research. SIETP can guide medical undergraduates to participate in scientific research, help them to complete project design, project implementation, report writing independently, so as to improve their scientific research ability.

In this study, a total of 200 undergraduates majoring in clinical medicine, nursing, medical laboratory technology and medical imaging technology in Health Science Center of Yangtze University were randomly selected and divided into two groups according to whether they had participated in SIETP, the scientific research group and the non-scientific research group. A questionnaire survey was conducted among them to investigate the current scientific research status and existing problems of medical students and analyze the influence of SIETP on medical students' scientific research literacy. It provides a theoretical basis for medical colleges to better carry out SIETP and to cultivate talents more effectively.

2. Methods

2.1. Scientific Research Status Questionnaire Design of Respondents

The questionnaire questions included students' general information, their understanding of scientific research work, their understanding of whether research opportunities are available by school, their willingness to conduct scientific research, their expected achievements in scientific research, their participation in scientific research, the distribution of medical students in different majors and grades participating in scientific research and their future career planning after graduation. After a small range of preliminary experiments, the questionnaire design was discussed again to improve the questionnaire, the time required for normal answer was estimated. Before issuing the questionnaire, the sender of the questionnaire was trained, then the sender handed out the paper questionnaire to the respondents and conducted face-to-face guidance. After all the question-

naires were collected, the researcher eliminated the invalid questionnaires according to the time required by the respondents to answer the questions and the completeness of the questionnaire answers.

2.2. Evaluation Methods of Scientific Research Ability

The respondents were divided into scientific research group and non-scientific research group. The two groups of students filled in the questionnaire to evaluate the scientific research ability. The content of the questionnaire included 15 questions in 5 topics, scientific research awareness (3 questions), such as attention to the university's scientific research activities, do you feel that scientific research activities are closely related to yourself and so on; Literature consulting ability (3 questions), such as how many English literatures can be reviewed in a week, whether you can understand these English literatures and so on; Project design ability (3 questions), such as whether you have designed projects independently or participated in project design and so on; Data processing/analysis ability (3 questions), such as whether you can apply statistical methods to analyze the data or not and so on; Paper writing ability (3 questions), such as have you written a scientific paper, do you know how to write a research paper and so on. Each question had five grades, with scores of 1 - 5 respectively. The scientific research ability was quantified as the sum of the scores of 15 questions.

2.3. Statistical Methods

The data of questionnaire survey was statistically analyzed by SPSS 26.0 software. The measurement data were expressed in $\bar{x} \pm s$, the comparison between groups was tested by t-test or Wilcoxon rank sum test, and the counting data were analyzed by χ^2 test.

3. Results

3.1. Analysis in the Scientific Research Status of Respondents

According to the results of the survey, among the 200 respondents, 130 of them didn't familiar with the specific content of scientific research, accounting for 65% of the total number of respondents and only 30 (15%) of them knew better. 64 (32%) respondents familiar with the scientific research opportunities provided by the school, while 82 (41%) respondents did not. 174 (87%) respondents expressed their willingness to participate in scientific research activities, of which 106 were willing to participate in scientific research in the form of SIETP, accounting for 53% of all respondents. 106 (53%) respondents expected to improve their basic scientific research ability, 50 (25%) respondents expected to publish scientific research papers, and 44 (22%) respondents expected to gain advantages in school evaluation and postgraduate entrance examination by participating in scientific research. Among the 200 respondents, only 44 (22%) had presided or participated in scientific research practice as the form of SIETP (Table 1). These results indicated that the participation rate of medical undergraduates in scientific research activities is low, and their understanding of scientific research is insufficient.

Table 1. The status quo of respondents' participation in scientific research activities.

Items	Choices	Students number	Proportion (%)
Understanding level of scientific research work	Not familiar	130	65
	General familiar	40	20
	Quite familiar	30	15
Whether school provide scientific research opportunities or not	Yes	64	32
	No	54	27
	Unclear	82	41
Willing to participate or not	Yes	174	87
	No	26	13
Willingness to conduct scientific research	Participate in teachers' projects	52	26
	SIETP	106	53
	Paper writing	42	21
Expectation of scientific research achievements	Basic ability of scientific research	106	53
	Advantages in school evaluation or postgraduate entrance examination	44	22
	Publish scientific research papers	50	25
Whether participate in scientific research or not	Yes	44	22
	No	156	78

3.2. Analysis of Scientific Research Participation of Medical Students in Different Majors and Grades

Among the 44 medical undergraduates who presided or participated in scientific research activities, 27 (61.4%) students were from clinical medicine, 7 (15.9%) students from medical laboratory technology, 6 (13.6%) students from medical imaging technology and 4 (9.1%) students from nursing. In terms of gender, male participants were more likely to participate in scientific research than female participants (28 (63.6%) vs 16 (36.4%)), respectively. All the respondents were divided into junior group (freshmen and sophomores) and senior group (Third to fifth year students). The survey results showed that 33 (75%) students who participated in scientific research activities were come from senior grades and only 11 (25%) students were from junior grades (Table 2). These results indicated that the students of clinical medicine, especially the senior students, paid more attention to the cultivation of scientific research quality, and the male students paid more attention to scientific research than the female students.

3.3. The Role of SIETP in Improving the Scientific Research Ability of Medical Students

According to whether or not they had participated in SIETP, we divided the objects into scientific research group and non-scientific research group. The survey showed that there were statistically significant differences between the two groups in the scientific research awareness, literature consulting ability, project design ability and data analysis and processing ability ($P < 0.05$), indicating that presiding or participating in SIETP can help students enhance their scientific

research awareness and improve their ability of literature consulting, project design and data analysis and processing. There was no significant difference in paper writing between the two groups ($P > 0.05$). Paper writing is a cumulative process, which needs to be exercised gradually after reading a lot of literature and mastering rich professional knowledge. It can't achieve obvious improvement effect only by participating in the project in a short time (Table 3).

3.4. The Influence of SIETP on the Future Planning of Medical Students

The survey showed that when asked about the future after graduation, the majority (88.7%) of respondents in the research group said that they would pursue a master's degree (52.3%) or even a doctor's degree (36.4%) after graduation, only 5 (11.4%) respondents would go to work after graduation. While in non-research group, 89 (57.1%) respondents would pursue a master's degree (46.8%) or a doctor's degree (10.3%) after graduation, 67 (42.9%) respondents would go to work after graduation. There was significant difference between the two groups ($P < 0.05$) (Table 4). These results indicated that medical undergraduates' participation in scientific research practices such as SIETP could help them better plan their post-graduation careers.

Table 2. Distribution of medical students in different majors and grades participating in scientific research.

	Students number (n = 44)	Proportion (%)	*P*
Major			<0.001
Clinical medicine	27	61.4	
Medical laboratory technology	7	15.9	
Medical imaging technology	6	13.6	
Nursing	4	9.1	
Sex			0.009
Male	28	63.6	
Female	16	36.4	
Grade			<0.001
Senior	33	75	
Junior	11	25	

Table 3. Scientific research ability scores in two groups.

	Scores		
	Research group (n = 44)	Non-research group (n = 156)	*P*
Scientific research consciousness	11.57 ± 2.12	6.59 ± 1.98	<0.001
Literature consulting ability	11.55 ± 2.53	5.23 ± 2.72	<0.001
Project design ability	9.32 ± 1.86	5.93 ± 2.03	<0.001
Data analysis and processing ability	12.39 ± 2.12	9.48 ± 1.89	<0.001
Paper writing ability	9.57 ± 1.79	9.15 ± 2.12	0.124

Table 4. The post-undergraduate life planning in two groups.

	Research group (n = 44)		Non-research group (n = 156)		
	Number	Proportion (%)	Number	Proportion (%)	*P*
Start job career	5	11.4	67	42.9	<0.001
Study for master's degree	23	52.3	73	46.8	0.318
Study for doctoral degree	16	36.4	16	10.3	<0.001

4. Discussion

4.1. Analysis of Problems and Causes in the Implementation of Scientific Research for Medical Undergraduates

Since our country made great efforts to cultivate undergraduates' scientific research innovation ability, we have made remarkable achievements in terms of students' innovation awareness and university management system, but there are still shortcomings (Lu & Zhang, 2010). In this survey, although the school provided scientific research opportunities and most students (87%) were willing to improve their scientific research ability by participating in scientific research practice, a considerable number of students didn't know enough about scientific research and the participation rate was low. Only 44 of the 200 respondents had participated in scientific research practice in the form of SIETP. These results suggest that although medical undergraduates can correctly recognize the importance of scientific research, their participation in scientific research was low due to their insufficient understanding of scientific research and the lack of effective publicity and incentives for undergraduate in universities. Clinicians must possess certain scientific research consciousness and thinking to better apply theoretical knowledge to clinical practice. Therefore, medical undergraduates should not only study the courses prescribed by the school, but also carry out scientific research ability training under the correct guidance of instructors to meet the needs of modern medical development.

4.2. Suggestions for Improving the Implementation of Scientific Research Activities for Medical Undergraduates

In view of the problems and related reasons in the implementation of scientific research for medical undergraduates mentioned in 4.1 above, medical colleges and universities should make corresponding improvement strategies to help medical students better participate in scientific research practice and improve their scientific research ability and scientific research literacy.

4.2.1. Update the Curriculum Structure and Integrate Scientific Research Thinking Training into Medical Courses

In this survey, 65% of students didn't familiar with the specific content of scientific research work, and 41% of them didn't know whether the school provides

scientific research opportunities or not. In addition, the majority (61.4%) of the students participated in scientific research were from clinical medicine major, followed by medical laboratory and medical imaging majors; nursing major has the lowest participation. The participation rate of senior students was higher than that of junior students, and the participation rate of male students was higher than female students. These results suggest that undergraduate medical education lays too much emphasis on professional basic courses and neglects the cultivation of students' scientific research and innovation ability, especially for junior students and medical students of other majors except clinical medicine. Universities should change their educational ideas, encourage students to carry on scientific research innovation and attach importance to cultivate their scientific research literacy. In order to equip students with basic scientific research skills, basic courses such as literature retrieval, medical statistics, creative thinking, and innovative methods should be offered for all medical majors. In the process of medical experimental lessons, apart from traditional teaching mode, pre-experiment should be added so that students can participate in the design of experimental process and optimization of protocol. Such an approach not only trains students' independent thinking skills but also stimulates their research interest.

4.2.2. Set up Scientific Research Training Programs and Implement Tutorial System

In recent years, medical universities in China have set up scientific research training programs for undergraduate students, among which, the SIETP has become the main form for college students to participate in scientific research (Chen, 2020). In order to implement the spirit of the National Conference on Undergraduate Education in Universities in the new era, mobilize the enthusiasm and initiative of college students to participate in scientific research and stimulate students' interest in scientific research and innovative thinking, Yangtze University has started the 15th batch of SIETP. This is very important for the cultivation of medical undergraduates' scientific research ability and thinking. The tutorial system is implemented when carrying out SIETP for undergraduates. Tutorial system has many advantages, such as clear responsibility and convenient communication and its implementation is especially suitable for the training of scientific research ability (Liao et al., 2022). Each tutor should not guide too many students, 2 - 3 students are the best. After the implement of tutorial system, students have the opportunity to directly participate in the tutor's scientific research projects, which further increases their opportunities to contact with scientific research.

4.2.3. SIETP Can Cultivate Scientific Research Ability and Innovative Thinking of Medical Students

In the field of higher medical education, it has become a consensus to conduct standardized and multi-way scientific research training for medical students and cultivate their innovative thinking (Lv et al., 2018). SIETP has become a better

training platform and an effective way to cultivate medical students' scientific research ability and innovative thinking. In this survey, students who had participated in scientific research practice had obvious advantages in scientific research consciousness, literature consulting ability, project design ability and data analysis and processing ability ($P < 0.05$). Therefore, medical universities should continue to strengthen the platform construction of innovative experimental programs for college students, encourage medical students to participate in innovative experimental programs and promote their comprehensive quality. More importantly, students should actively participate in SIETP to cultivate their innovative quality and their information processing ability as soon as possible.

4.2.4. SIETP Can Help Students Better Plan for Future

In this survey, most of the respondents who participated in scientific research practice (86.6%) would continue to pursue a master's degree or even a doctor's degree after graduation. At present, some scientific research tasks need to be completed in the stage of master's and doctor's studies. SIETP can help medical undergraduates receive research training earlier, develop good awareness of scientific research, and exercise the ability to collect literature independently, so as to lay a good foundation for the future research work of master's and doctor's studies.

5. Conclusion

The scientific research ability of medical students can be significantly improved by presiding or participating in SIETP, including the ability of literature review, the ability of logical thinking and innovative thinking, and the ability of analyzing and solving problems. In addition, analysis and processing of experimental data enabled the team members to master certain statistical methods. Therefore, medical colleges should continue to strengthen the platform construction of innovative experimental programs for college students, encourage medical students to participate in innovative experimental programs, and promote their comprehensive quality (Wu & Wu, 2019).

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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