

The current status of Pathology education: A survey among Chinese medical students

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Abstract

Background

Pathology education transfers knowledge of Pathology and guides students to become pathologists. Recently, Ministry of Education of the People's Republic of China strongly advocated establishing the system of 'Golden Online and Offline Courses', which indicates online courses will play important roles in college education. Furthermore, the number of pathologists has fallen far behind the clinical needs. To solve this health issue and implement the policy from Ministry of Education, improving current Pathology education is necessary, and first is to know students' opinions on the present courses and their professional choices.

Methods

Questionnaires covering the quality of traditional courses, the attitude towards the online courses, and the suggestions for optimizing courses were designed and applied via web link. Whether students want to become pathologists and the underlying reasons are also incorporated into this survey. Medical students from certain colleges in Nanjing were participants. The collected data were assessed by corresponding percentages.

Results

Of the 215 valid responses, half of undergraduate students show their interests in Pathology courses, and among them, 50% express that they may become pathologists. However, the percentage is only 18.03% in the group without interest. For optimizing curriculums, the top two suggestions are introducing more clinical cases (undergraduate students, 74.42%; graduate students, 79.09%) and making the classes lively and interesting (undergraduate students, 67.44%; graduate students, 62.79%). Around 80% of students consider online courses as good supplementary materials to traditional courses, and half prefer online-offline mixed learning model. Salary, interest, and employment status are main factors influencing students' professional choices.

Conclusions

Students are generally satisfied with the traditional Pathology courses, and the online courses are good supplementary materials in their opinions. Clinical cases are suggested to be introduced in classes. It is more likely for the students who have interests in Pathology to become pathologists. The main obstacles students will not become pathologists are boring work and unsatisfactory salary.

Background

To improve teaching quality, promote the revolution of classroom teaching, and explore the new form of intelligent education, Ministry of Education of the People's Republic of China has strongly advocated establishing systems of 'Golden Online and Offline Courses'. (1) This policy makes college education face

new opportunities and challenges. Optimizing the traditional courses, establishing online courses and rationally integrating the two together are important tasks of modern university teachers.

Pathology is a discipline bridging basic medicine and clinical medicine, therefore, it is a compulsory course for medical students. Though online Pathology courses are available on some platforms of network education, traditional classroom education is still the main form of teaching and learning nowadays. Online Pathology courses mainly serve as materials for medical students' self-learning or health workers' continue education. Because of the trend that online study will have a higher status in college education, current teaching structure and teaching pattern of Pathology are predicted to be changed.

Pathologists are indispensable roles for diagnosis of diseases in clinic. However, the number of pathologists has fallen far short of numbers needed in clinic. It is estimated that there is a shortage of 90,000 pathologists in China. (2) Similar problem is also raised in United States, Canadian, and United Kingdom. (3–6) Pathology education, especially in undergraduate students, may be the first chance for them to know the roles of pathologists. Therefore, the purpose of teaching activities is not only transferring knowledge of Pathology but also guiding students to set up correct professional sense.

Under these circumstances mentioned above, students' opinions on the present Pathology courses, the condition of their online study, their professional choices, and the underlying reasons are important sources to optimize the current Pathology education. However, up to now, there has been no report offering such kind of information. Thus, we conducted this survey to extensively understand these conditions.

Methods

Two types of questionnaires were developed and implemented for undergraduate students and graduate students respectively. Both addressed topics including students' views on the quality of traditional courses, the attitude towards the online courses, the suggestions for optimizing courses, the experience of online study, the professional choices and the underlying reasons.

Questionnaires were applied via web link (7, 8) to students from Medical School of Southeast University, Medical School of Nanjing University, and Nanjing University of Chinese Medicine. Data was collected two days later. Conventional statistics, classified statistics, and cross-over statistics were carried out for the data analyses. Figures were prepared using Prism version 6 (GraphPad Software).

Results

Demographics of survey participants

Among the 215 medical students who responded to the questionnaires, 60% are undergraduate students, and 40% are graduate students. The reported number of participants was 139, and 76 for female and

male, respectively. All the participants have completed Pathology courses in college (see Table 1).

Table 1
Demographics

	Number of students	Percentage (%)
Education background		
Undergraduate	129	60
Graduate	86	40
Gender		
Female	139	64.65
Male	76	35.35
Status of Pathology study		
Completed	215	100
Characteristics of the participants.		

Suggestions for optimizing traditional Pathology courses

As traditional courses are playing a vital role in current Pathology education, we first want to know how students evaluate them. The quality was divided into four levels: excellent, good, pass, and fail. It is shown that majority of students are satisfied with the current courses, indicated by the total percentage of students choosing "Excellent" and "Good" is higher than 90% (Fig. 1A).

To optimize the traditional Pathology courses, a multiple-choice question was set, with options including teaching content, class atmosphere, and classroom interaction. The result shows that more than 70% of students want to learn more clinical cases based on the basic knowledge, especially the graduate students (79.07%) (Fig. 1B). The second most valuable suggestion is making the class lively and interesting. Students choosing this option account for 60% more of all the participants. Another important suggestion from around half of graduate students is explaining knowledge points deeply, showing their requirements in depth and even width of Pathology knowledge. Moreover, interaction between teachers and students in class is welcomed as the result presents. Other proposals with very low percentage include using more pictures to illustrate pathologic changes, slowing down the speech, and leaving some homework.

Students' perception of online courses

A large number of online courses are available for various subjects nowadays. Our group also launched three kinds of online Pathology courses in platform of Chinese University Massive Open Online Courses (MOOC). To know students' perception of online courses, their experience of online study, and what kind

of learning model they like, three single-choice questions were set. Students were asked to choose one option from the given answers. As the Fig. 2A shows, around 80% of students agree that online courses are significant supplements to traditional courses. Only a few think online courses will displace traditional courses, or they are only of benefit to students without sufficient traditional teaching resources, or they are dispensable.

In the investigated population, 68.99% of undergraduate students and 46.51% of graduate students have online study experience (Fig. 2B). Around 10% students underwent online study but not about unspecified courses. However, there are still 17.8% of undergraduate students and 45.3% of graduate students who have never participated in any online course study.

To know which learning pattern students like, an assumption was made to exclude any difference between contents of online and traditional Pathology courses. Even in this situation, students prefer the offline model or mixed model (Fig. 2C). Furthermore, the number of students choosing online model and mixed model is larger in graduate group (70.93%) than it in undergraduate group (54.26%). One explanation is that graduate students need more flexible time, while undergraduate students need more face-to-face interactions with teachers.

Factors influencing students' professional choices

Guiding students to develop appropriate ideology of employment is an important content in teaching activities. Students in this new era have their own characters and life attitudes. Hence, a question was designed to reveal what factors influencing their professional choices. To both graduate students and undergraduate students, salary, interests, and employment status are the top three factors, followed by workload, academic position of advising professor, viewpoints of parents, and other individual factors. Interestingly, the percentage of students choosing salary or employment status is obviously higher in undergraduate group than it in graduate group. But Option "Interests" stand first in the factors considered by graduate students (Fig. 3).

Factors diminishing students' willingness to become pathologists

As there is a large shortage of pathologists in clinic, we asked why the graduate students, who have decided their vocations, did not choose to become pathologists. Option "Slow development" stands for the slow development of pathology departments in China. Option "Lack of competitiveness" means that pathology department is often less competitive compared with other departments in clinic. The result shows boring work with low personal achievement is the leading influence factor. Low pay and less attention from society rank second and third, respectively. Deserved to be mentioned, heavy work load is not a major factor. Only 25.58% of students make this option (Fig. 4A).

To the undergraduate students, a cross-over analysis was conducted to illustrate the relationship between their feelings onto Pathology courses and their willingness to become pathologists. As the Fig. 4(B-a)

shows, half of the students like Pathology courses, and similar number of students have no strong feeling, while only 1.5% dislike it. In the population of students who like Pathology courses, 50% of them think that it is possible for them to become pathologists. However, the possibility reduced to 18.3% in the population without strong feeling onto Pathology (Fig. 4(B-b)). This is in line with the result from Fig. 3, which indicates that interest has a great impact on students' professional choice.

Discussions

Students are direct subjects of teaching activities, thus, their opinions on the current education and suggestions to optimize it deserve special attention. This survey was designed to know their evaluation on the quality of traditional Pathology courses and their experience of the online study. Before we guide them to become pathologists, we need to find out the factors encouraging or deprecating them to become pathologists.

The results of this survey clearly clarify their suggestions for our traditional curriculums. The top one suggestion is introducing more clinical cases. Indeed, it meets the character of this discipline which bridges basic medicine and clinical medicine. We also implemented this recommendation in our online course Systemic Pathology last year, and we have received a lot of positive feedback now. Moreover, one previous study also illustrated the benefits of applying clinical case-based portfolios in Histopathology education. (9) Lively and interesting classes are welcomed by both graduate and undergraduate students, which was supported by another survey showing most medical students affirm the use of humor in medical didactics. (10) Indeed, it has been confirmed that funny humor in class produces many advantages. (11)

Online courses hold the advantage of no limitation to the number of students, the time and space of study. Large scale of participants can learn in their own way at the same time and various places. In particular, traditional teaching activities in college are stopped now in China because of 2019 novel coronavirus disease (COVID-19). Fortunately, teachers are giving their lectures on web platforms to solve this problem. Therefore, online study is an excellent learning tool in such kind of public event.

To apply online courses effectively in teaching activities, it is necessary to take students' study models into account. Our results show that an online-offline mixed model is the most acceptable one to both undergraduate students and graduate students. Even the contents of the traditional and online Pathology courses are same, less students chose online model compared with those who chose offline model. In addition, increasing the proportion of traditional courses to undergraduate students is not ignorable, as they need more direct interactions with teachers.

Shortage of pathologists is a global problem and it is inhibiting progress on universal health coverage. (12) It is reported that heavy workload, low pay, and threat of lawsuits relating to improper diagnoses discourage pathology enrollments.(13) The results from our survey indicate that boring work with low personal achievement, unsatisfactory salary, and less attention from society are noteworthy obstacles. As

students who have interests in Pathology are more likely to become pathologists (Fig. 4(B-b)), developing students' interest should be one of fundamental purposes in Pathology education.

If gender is considered, it is interesting to find that male students are more likely to attend online study than female students. In the population of graduate students, 49.15% of female participants have never attended online study, while the percentage in male group is 37.04% (see Additional file. 1A). Another obvious difference is observed when we analyze the main reasons why they did not become pathologists. More male students chose "Boring work with low achievement", while more female students chose "Less attention from society", "Slow development", and "Heavy workload". It seems that female students concerned more about the work environment (see Additional file. 1B).

In conclusion, this study makes us learn more about the students. Given the small sample size of the survey, it is hard to make a definite conclusion about how to build up a good system of online-offline courses, and what are the most important factors causing the shortage of pathologists. However, students' suggestions for optimizing traditional Pathology courses, their favorable learning models, and their concerns about becoming pathologists or not are valuable data to improve current Pathology education.

List Of Abbreviations

COVID-19 = 2019 novel coronavirus disease

Declarations

Ethics approval and consent to participate

This study was approved by the Ethics Committee of Medical School, Southeast University. All the procedures in this survey were carried out in accordance with the approved guidelines and regulations. All the participants were informed about the purpose of this survey, and this information was given in written form. Participation was voluntary and anonymous.

Consent to publish

Not applicable.

Availability of data and materials

The questionnaires and datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

CX and XB designed the study and the questionnaires. CX gathered and analyzed the data, and drafted the manuscript. YL contributed to revising the manuscript. XB, PC, YL, and MP took part in the discussion and modification of the questionnaires. All authors have seen and agreed to the submission of the final manuscript.

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Figures

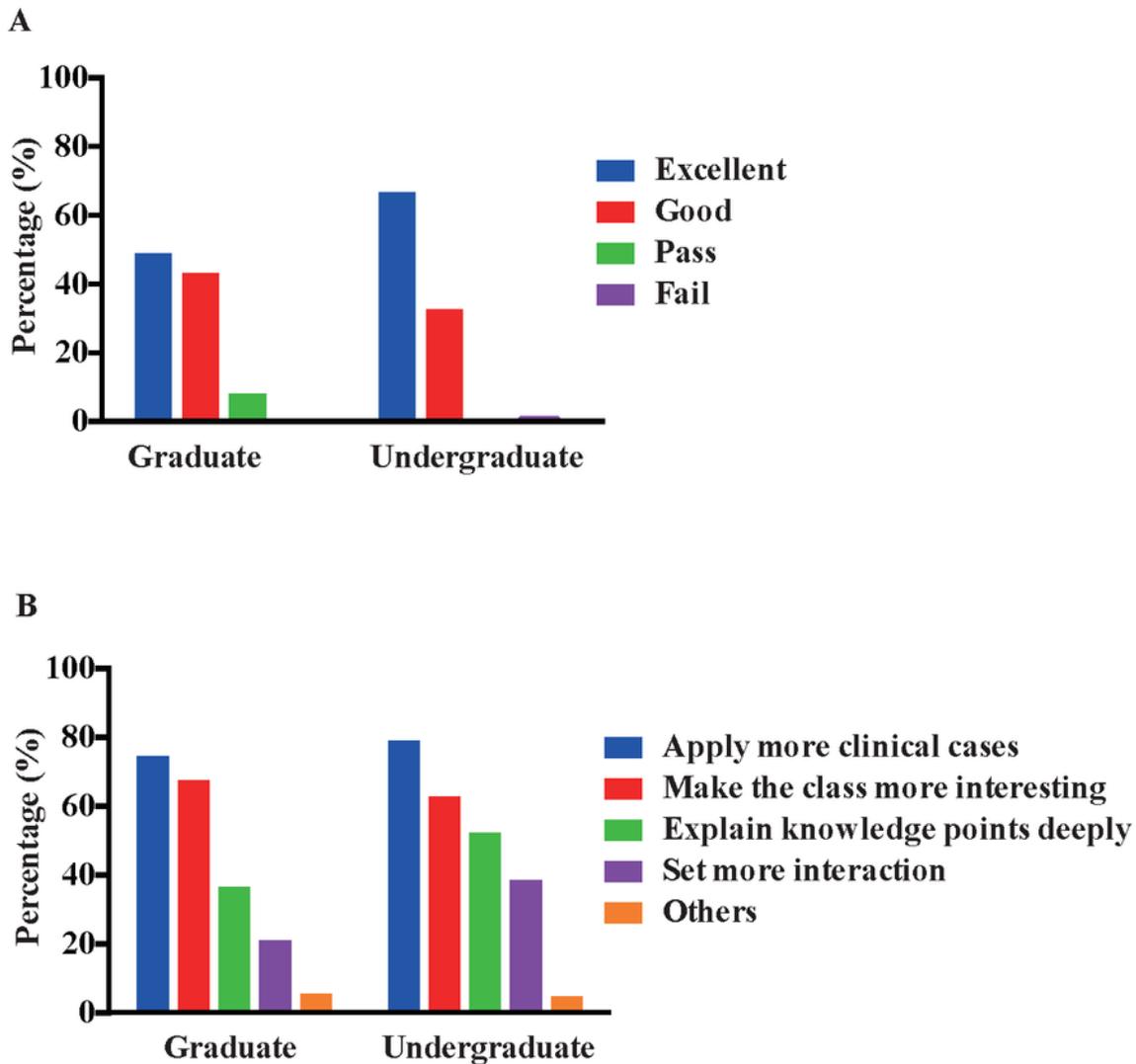


Figure 1

Suggestions for optimizing traditional Pathology courses. (A) Students' evaluation of the traditional Pathology courses. Traditional Pathology courses were divided into four levels: Excellent, Good, Pass, and Fail. Every student chose one option based on his/her integrative evaluation. (B) Suggestions for optimizing traditional Pathology courses. This is a multiple-choice question. Students were asked to

choose any option which they agreed with. The result is the ratio of students who chose the specific option to the total number of students.

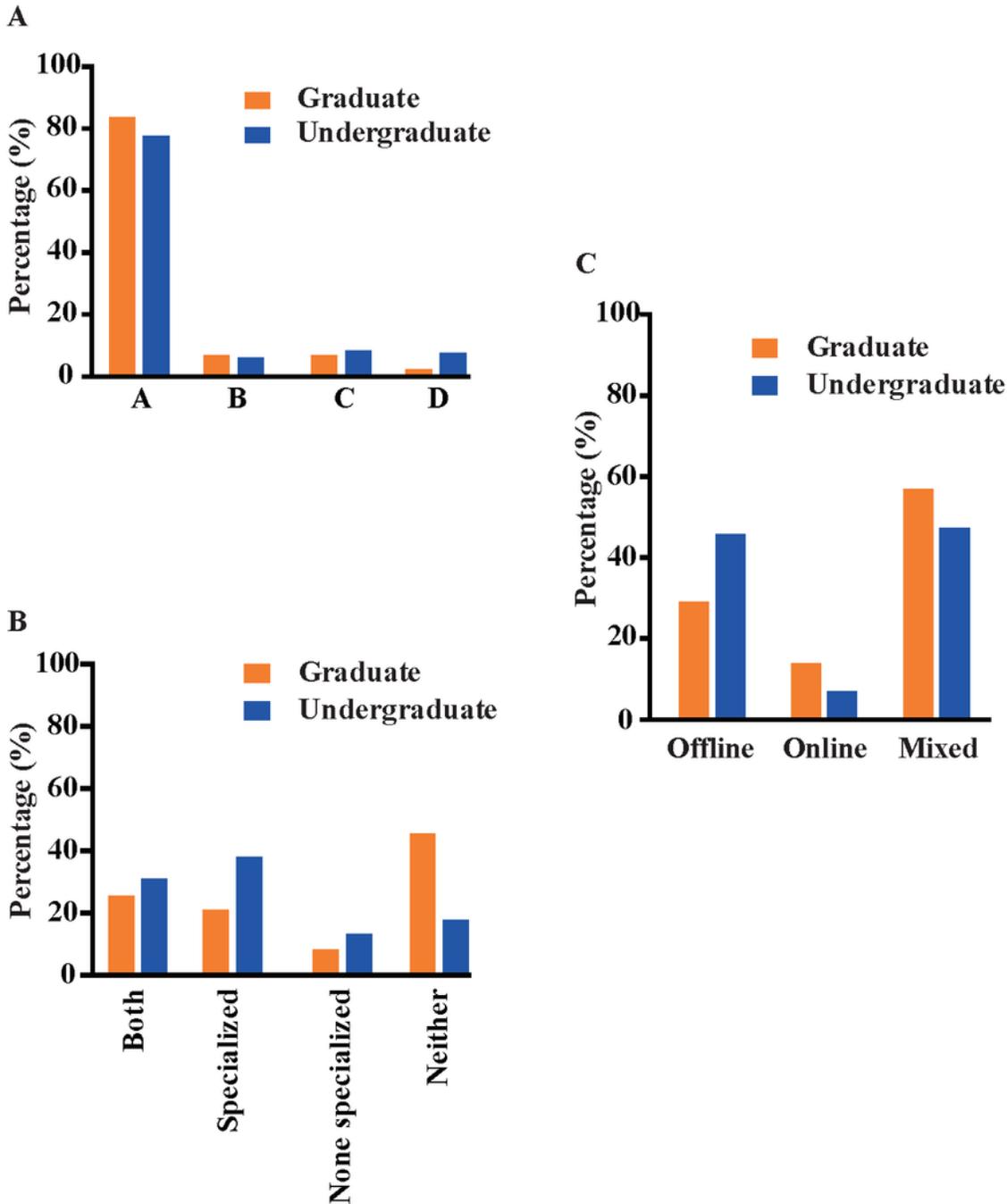


Figure 2

The role of online courses in students' opinions and their learning models. (A) A, B, C, and D means "An important supplement to traditional course", "Possible to instead of traditional course", "Only valuable to students with insufficient offline resources", and "Just a stunt" respectively. (B) The question is "Which of

the following online courses have you ever attended?”. (C) The question is “If contents of online Pathology courses and offline/traditional Pathology courses are same, which learning model do you prefer?”. All these questions are single-choice questions. The data is the ratio of students who chose the specific option to the total number of students.

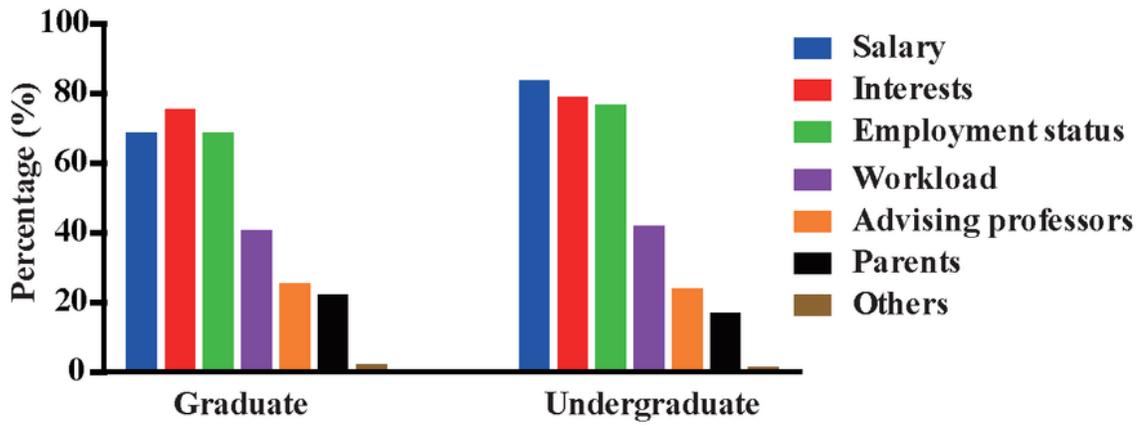


Figure 3

Factors influencing students' professional choices. Students were asked to choose three most important factors they considered when they decide their careers. The result is the ratio of students who chose the specific option to the total number of students.

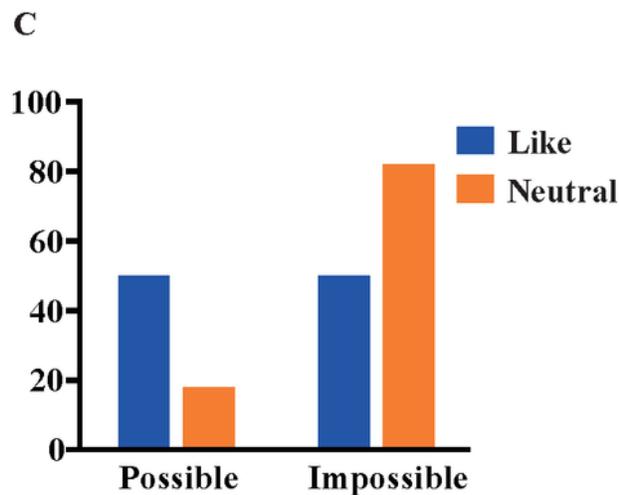
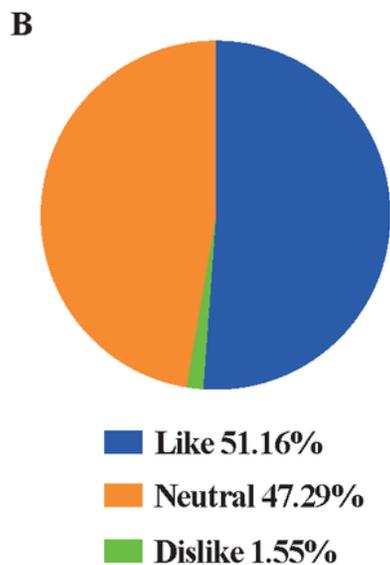
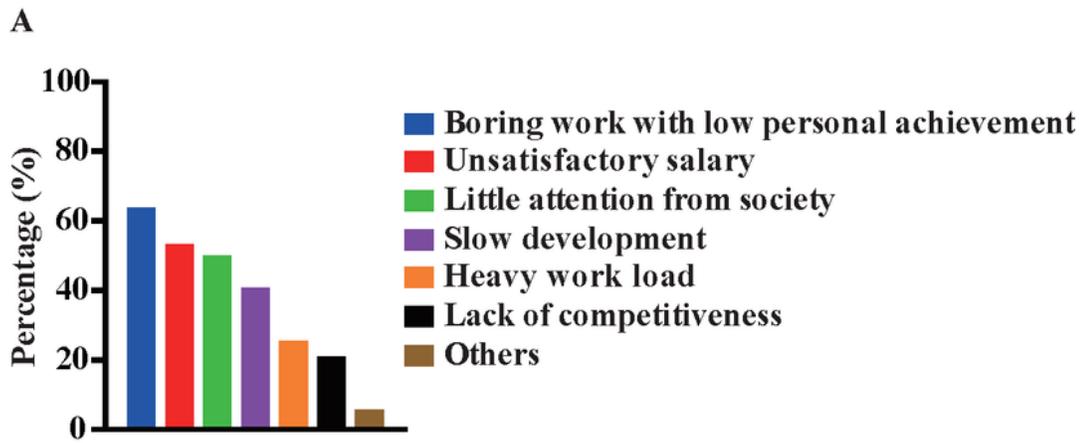


Figure 4

Reasons underlying the unwillingness of students to become pathologists. (A) The question is “Why don’t you want to become a pathologist?”, and it is a multiple question for graduate students. (B) These are

two questions for undergraduate students. (B-a) The question is “How much do you like Pathology subject?”. Options included “To a great extent”, “To some extent”, and “Not at all”. The result is the ratio of students who chose the specific option to the total number of students. (B-b) The question is “Is it possible for you to become a pathologist?”. The data is analyzed by the possibility to become a pathologist and the emotion on the Pathology subject.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Additionaldata1.pdf](#)