Using “Xuexi Tong Platform”as the Major Approach to Explore of Teaching Models of “Histology and Embryology”and “Pathology” in the Time of COVID-19

Qinlai Liu, Wenping Sun, Changqing Du, Leiying Yang, Na Yuan, Haiqing Cui, Wengang Song, Li Ge

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Abstract

Background: The Coronavirus Disease 2019 (COVID-19) epidemic has suddenly swept the world, and online courses have completely replaced offline courses. This is a new type of teaching practice in China and even the world?which needs our exploration and research. “Histology and Embryology” and “Pathology” are both basic medical morphology disciplines. Thus, the previous teaching mode is no longer suitable for teaching in this special period.

Objective: The purpose of this research is to explore a new teaching mode of “Histology and Embryology” and “Pathology”under the circumstances of the Coronavirus Disease 2019 (COVID-19) epidemic, and to study its application effects.

Methods: From March to July 2020, our teaching team conducted research on 512 students in 10 classes of Grade 2019 undergraduate clinical medicine students who study “Histology and Embryology” and Grade 2018 undergraduate clinical medicine students who study “Pathology”, applying the “Internet + education” approach. The teaching team adopted a new teaching mode involving diverse online teaching methods, carefully designed and selected teaching contents, and various teaching activities, which included: 1. New flipped classroom; 2. Screen-to-screen experimental teaching; 3. Drawing competitions; 4. A writing activity themed “The You I Know-During the Coronavirus Disease 2019 (COVID-19) epidemic”. When the teaching was about to end, the “Questionnaire Star” is used to make investigation about the feedback of students on the theoretical teaching mode and the use of the experimental platform.

Results: Students accepted “Seven-in-One” teaching mode of “video + materials + chapter tests + interaction + homework + live broadcast + case analysis/discussion”. The guidance of online learning which integrated six online applications namely “Xuexi Tong Platform + Tencent Conference Live + Chinese University MOOC/school online MOOC + medical morphology digital teaching platform + WeChat/QQ platform + questionnaire star survey” was also well received by students. The teaching team received 244 and 246 valid questionnaires for the two grades respectively, and the number of students’with satisfaction response reached 71.28%.

Conclusions: This study shows that this teaching mode, which proved feasible and acceptable during the epidemic, laid a solid foundation for future online and offline hybrid teaching.

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Original Manuscript

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Conclusion: This study shows that this teaching mode, which proved feasible and acceptable during the epidemic, laid a solid foundation for future online and offline hybrid teaching.

Keywords: The Coronavirus Disease 2019 (COVID-19) epidemic；Histology and Embryology；Pathology; Teaching/Education

Introduction:

The Coronavirus Disease 2019 (COVID-19) outbreak has rapidly transitioned into a worldwide pandemic (1). It has driven the fastest changes to higher education across the globe(2), rather than cancel their courses many instructors are working to deliver content and assess learning via distance learning and online pedagogies (3). This is an unprecedented form of teaching, which has brought huge challenges to teaching and unprecedented opportunities. The Ministry of Education of China issued the call of “Suspension of classes and non-stop classes” (4). We organized embryology and pathology teaching teams to actively respond to the call of the country and strive to explore online teaching methods. In this new era of information, people have the conditions for life-long learning and free to autonomous learning anytime, anywhere through various online teaching platforms. However, online teaching lacks the “presence” and “realism” of classroom teaching (5). To ensure the effectiveness of teaching, we have carried out diverse teaching practices which improved the communication between teachers and students during online education and promoted the autonomy of students in learning. This article takes the online teaching of “Histology and Embryology” and “Pathology” performed by Shandong First Medical University during the epidemic period as examples to explore specific strategies to ensure the quality of online teaching.

The “Histology and Embryology” is a medical morphological foundation course that studies the micro structure of healthy body using microscope, the related function and individual occurrence development (6), while “Pathology” is a course of medical morphology based on the micro-structure of healthy body, to instruct the structure change of the body organization in the state of disease and to explore the etiology and pathogenesis of disease, functional change and basic outcome of disease (7). It is a bridge course which, bases on “Histology and Embryology”, joins basic medicine and clinical medicine courses.

The two courses are both theoretical and practical basic courses, so the previous theoretical and experimental teaching and assessment models were no longer suitable in the global situation during the COVID-19 epidemic. It was vital to adjust the teaching and training strategies for medical students to ensure curriculum completion with safety (8). In order to let students transit smoothly from the study of Histology and Embryology to the study of Pathology, the teachers of the two research offices worked together and cooperated closely, creating the new teaching mode.

The online teaching put higher request forward to teacher’s own quality. Teachers transform the

traditional classroom teaching to online teaching, which requires teachers to master both live teaching software, online teaching software. The adaptation of the online teaching is also needed, as well as leading students to use the virtual experiment platform to grasp the essence of some morphological slice. Therefore, teachers need to make use of modern network technology, take students as the main body and teachers as the leading role, “teach in learning and research in teaching”. Teachers should constantly improve teaching methods and try to practice teaching, so as to form an effective online teaching mode characterized by morphological learning.

Methods:

Participants:

This study was conducted in Shandong First Medical University from March to July 2020. There are 254 students of Histology and Embryology in Grade 2019 (Grade 1) of Clinical Medicine and 258 students of Pathology of Grade 2018 of Clinical Medicine (Grade 2) in Shandong First Medical University. 512 students in 10 teaching classes was held exploratory research teaching.

Carefully design teaching methods and select high-quality content

We implement teaching standards in accordance with normal teaching time, teaching content and plans, and pay attention to the attendance, homework, teaching content, and assessment. Before class: upload the textbook e-course in advance to the information column of “Xuexi Tong Platform” for students to view and download. The teaching PPT will be distributed to students. We select and integrate MOOC for class content, and inform students to go to the related platform to learn the related content, including courses in Chinese university MOOC, online courses from Tsinghua University school of medicine, the related courses from adopted by Beijing university school of medicine for students to prepare to study the content. Students who don’t understand the knowledge through learning could feedback to the teacher in class in time through the group chat of the APP of “Xuexi Tong Platform”.

Classroom: Start a half-hour class sign-in 10 minutes before class to inform students to quickly enter the class. Use the video about the important and difficult points of the course recorded by the teacher as the task point in the “Xuexi Tong Platform”, inform the classroom content and time schedule in advance, and distribute in-class tests, quick-answer questions and specified questions at regular intervals. All were recorded in formative evaluation. Before the end of the class, set aside a certain amount of time for problem-solving. Everyone asks questions. Teachers and students give timely answers and help in the group chat online. After each chapter, a case discussion question related to the teaching content is arranged. In the discussion area of“Xuexi Tong Platform”, opinions on case analysis were put forward, and the teachers give scores and comments.

After class: Once a week, we used the “Tencent Meeting” live broadcast Q&A link to check the deficiencies in online teaching knowledge, and conducted live broadcast answers to the problems encountered by students during class, and solved problems in time. Guide students to write chapter mind maps after class.

Application of New Flipped Classroom Teaching Mode

In the “Respiratory System” chapter, the team used the “Tencent Conference” online classroom and online course resources to integrate the new “flipped classroom” teaching mode to replace the traditional face-to-face and offline flipped teaching mode. Taking pathology teaching as an example, the teacher extracted ten themes of the “respiratory system”: 1. Anatomical structure of respiratory system, 2. Lobar pneumonia, 3. Lobar pneumonia, 4. Interstitial pneumonia, 5. Chronic Bronchitis, 6. Chronic obstructive pulmonary emphysema, 7. Silicosis, 8. Pulmonary heart disease, 9. Lung cancer, 10. Nasopharyngeal carcinoma.

The monitor and classmates selected the group leader on the WeChat platform. The 108 students in the class were divided into 10 groups and a flipped classroom activity was carried out on the “Xuexi Tong Platform”. Under the surveillance of the EV screen recording, we used “Excel” to determine the specific group assignments of the ten major topics. Each group selects a representative to conduct the presentation of the topic. The host conducted the presiding work through the “Tencent Conference” to ensure that every student who does the presentation of which expressions are smooth and seamless. Before the class, the students learned the contents of the MOOC and the task points; during the class, each group represented in the “Tencent Conference” to give presentations (see Figure 1), and the teacher made comments at last.

Screen-to-screen experimental teaching

The teaching team selected the medical morphology digital teaching platform (pt6.humanyun.com) as the website and teaching platform for students to view virtual slices. Two weeks before the experiment class, the instructor carefully read the platform slices, selected the most suitable explanation slices, and used the “EV screen recording” to make videos of dynamic viewing of the slices and the PPT courseware content of the lectures, and uploaded them in advance to Xuexi Tong Platform. During the class, the video was sent to the group chat of APP for students, and every student was required to post the content of the picture they have drawn to the group before get out of class, then the teacher will comment in time.

Participate in the drawing competition

We actively encouraged students to participate in the “Selection of Morphological Drawing Works of College Students in Medical Colleges” organized by the Basic Medicine Group of the Joint

Association of the National Experimental Teaching Demonstration Center of Colleges and Universities. The Department of Histology and Embryology and the Department of Pathology divided the student drawings collected from the 2019 and 2018 levels into the histology and embryology picture group and the pathology picture (gross pathology and histopathology) group, and then from more than 30 pictures with diagnosis, description and annotation. Among the pictures, 10 were selected for further guidance and sent to the organizing committee to participate in the selection.

Hold a theme event

Our teaching and research team held a writing theme activity with the content of “The You I Know-During the Coronavirus Disease 2019 (COVID-19) epidemic”. The answer format of the topic was not limited, based on the medical knowledge learned, it can be essays, poems, songs or even videos. Teachers sent many links about COVID-19 to students through WeChat in advance to enrich their knowledge.

Use “Questionnaire Star” to evaluate the application effect of the new teaching mode

Two weeks before the end of the teaching, students from Shandong First Medical University’s clinical medicine major Grade 2019 undergraduate Class 5, 6, 7, 8 and publicly funded clinical medicine class 3, clinical medicine major Grade 2018 undergraduate classes 3, 4, 5, 6, and publicly funded clinical medicine class 4 were used as the survey objects. “Questionnaire Star” was used to investigate the application effects of the new teaching model and seek common progress.

Results:

Carefully design teaching methods and select high-quality content

The percentage of students who completed task points is 100%, and they all completed the task points on time. Most of the students took the initiative to discuss the case analysis and submitted the writing of the mind map on time (Figure 2). In the past, formative evaluation only accounted for 20% of the final grade of the course. Due to the epidemic, in order to urge everyone to better take active online learning, we have increased the formative evaluation to 40% of the final grade, of which the writing of experimental reports accounted for 15%, online learning accounts for 25%. The online learning is divided into 100 points, specifically including sign-in (10%), case analysis (10%), chapter test (10%), task point viewing (30%), classroom test (10%), Interaction (5%), flipped classroom performance (10%) and theme activity performance (5%), mind map writing (10%).

Application of New Flipped Classroom Teaching Mode

Leave a little time at the end of each group of presentations, and each student goes to Xuexi Tong Platform to rate the expression of the topic. The score within the group accounts for 20% and the

score between groups accounts for 40%. Teachers' ratings account for 40%. Students build study groups through WeChat and QQ, learn from each other, discuss with each other, and use various learning resources flexibly.

Screen-to-screen experimental teaching

Most of the students mastered the content of the teaching task during the classroom, drew the ideal picture required by the teacher and posted it in the group chat on the Xuexi Tong Platform. Through comments, a small number of drawing deviations were also rectified and drawn to meet the teacher's requirements.

Participate in a drawing competition

Some of the students used computer drawing, some adopted hand-drawn. Some of them drew the general specimen of lung cancer, some drew the normal structure of liver tissue (see Figure 3), some drew the normal structure of small intestinal villi, and some drew squamous cell carcinoma (see Figure 4), some draw chronic pulmonary congestion, some draw pneumonia caused by COVID-19, some draw fatty liver, and so on.

Hold a theme event

The students responded enthusiastically. Some of them wrote long papers and cited literature, some wrote beautiful poems, some changed the lyrics of songs, some drew meaningful pictures (see Figure 5), and some of the students made PPT and recorded an uplifting video...

Use "Questionnaire Star" to evaluate the application effect of the new teaching mode

A total of 244 valid embryology questionnaires and 246 valid pathology questionnaires were received through the "Questionnaire Star" teaching feedback activities. The effective ratio is 95.7% (490/512). Among them, they are satisfied with the theoretical teaching mode to a large extent and to a greater extent. Histology and embryology accounted for 71.28%, and pathology accounted for 80.52% (see Table 1). For the use of the experimental platform to a large extent and to a greater degree satisfaction, "Histology and Embryology" accounted for 70.9 %, pathology accounted for 80.08% (see Table 1). Ability training in all aspects is stronger than traditional classroom teaching. Histology and embryology accounted for 19.26%-18.85%, and pathology accounted for 23.17%-24.8% (see Table 2).

Through the online learning of histology and embryology and pathology, more than 60% of students can understand and master the theoretical knowledge learned. Histology and embryology accounted for 82.37% (see Figure 6), and pathology accounted for 84.15% (see Figure 7). When asked about the ideal way of learning in the future, 6.97% of histology and embryology (see Figure 8) and 8.13% of pathology (see Figure 9) students with strong self-learning ability tend to teach

online. 91 people (36.99%) in pathology tend to return to offline teaching, and 124 people (50.41%) (see Figure 9) prefer online and offline mixed teaching. On the other hand, 127 (52.05%) of histology and embryology (see Figure 8) tended to return to offline classroom teaching after the epidemic.

Table 1. Online Teaching Survey Questionnaire Results Part 1

survey content	Very satisfied, n(%)	A greater degree of satisfaction, n(%)	Generally satisfied, n(%)	Less satisfied, n(%)	Dissatisfied, n(%)
1. What do you think of the current teaching mode of histology and embryology/pathology theory? Are you satisfied?	64(26.23)/ 78(31.71)	110(45.08) / 125(50.81)	57(23.36)/ 36(14.63)	7(2.87)/ 3(1.22)	6(2.46)/ 4(1.63)
2. Is the online platform of histology and embryology/pathology experiment satisfactory?	63(25.82)/ 85(34.55)	110(45.08) / 112(45.53)	58(23.77)/ 36(14.63)	8(3.28)/ 8(3.25)	5(2.05)/ 5(2.03)
3. Do you think the current teaching goals of histology and embryology/pathology are clear?	73(29.92)/ 92(37.40)	109(44.67) / 113(45.93)	51(20.90)/ 36(14.63)	7(2.87/) 3(1.22)	4(1.64)/ 2(0.81)
4. Do you think the current teaching arrangements for histology and embryology/pathology are reasonable?	71(29.10)/ 102(41.46)	114(46.72) / 116(47.15)	50(20.49)/ 24(9.76)	7(2.87)/ 2(0.81)	2(0.82)/ 2(0.81)
5. Your attitude towards the quality of online teaching micro-videos for histology and embryology/pathology?	53(21.72)/ 88(35.77)	114(46.72) / 111(45.12)	67(27.46)/ 37(15.04)	7(2.87)/ 7(2.85)	3(1.23)/ 3(1.22)

Table 2. Results of online teaching survey questionnaire part 2

survey content	% Very	Helpful,	Helpful,	Not

	helpful, better than traditional classroom teaching, n(%)	similar to traditional classroom teaching, n(%)	but not as good as traditional classroom teaching, n(%)	helpful, n(%)
1. In terms of improving learning efficiency and quality and solving difficult problems, the current online teaching of histology and embryology/pathology	47(19.26)/ 57(23.17)	96(39.34)/ 97(39.43)	95(38.93)/ 88(35.77)	6(2.46)/ 4(1.63)
2. Mobilize students' learning enthusiasm, consciousness, initiative, histology and embryology/pathology online teaching	48(19.67)/ 58(23.58)	93(38.11)/ 90(36.59)	94(38.52)/ 89(36.18)	9(3.69)/ 9(3.66)
3. Current online teaching of histology and embryology/pathology in terms of knowledge summary, integration, application and systematic understanding and memory	45(18.44)/ 57(23.17)	97(39.75)/ 100(40.65)	94(38.52)/ 84(34.15)	8(3.28)/ 5(2.03)
4. For unity and cooperation, language and communication skills, problem-solving, online teaching of histology and embryology/pre-pathology	46(18.85)/ 61(24.8)	95(38.93)/ 92(37.4)	92(38.11)/ 84(34.15)	10(4.10)/ 9(3.66)

Discussion:

Principal results:

The teaching team carefully conducted teaching design. On one hand, it refined teaching content, attracts students'attention, and fully mobilizes students' enthusiasm; on the other hand, it organized excellent teaching resources to facilitate students' learning in and out of class and stimulate their interest in learning. Teachers have changed from knowledge imparters to instructors who help students learn, turning the "teaching-centered" of former teachers into the "learning-centered" of

students. Case analysis, which strengthens and consolidates knowledge points, and integrates the knowledge learned, is required in the final exam. It is also a very good material question used to develop problem-based learning (PBL) or Clinical Pathology Conference (CPC) teaching. The training of case analysis questions can cultivate students' clinical thinking ability; "A thousand words are not as good as a picture", the writing training of mind map can strengthen students' understanding and memory of knowledge, improve learning efficiency, cultivate divergent thinking. In addition, students are promoted to build a complete knowledge system and be able to integrate knowledge.

Our teaching team emphasized "Internet+Education", using"Seven-in-One" teaching mode of "video + materials + chapter tests + interaction + homework + live broadcast + case analysis/discussion"and adopted six online applications namely "Xuexi Tong Platform + Tencent Conference Live + Chinese University MOOC/school online MOOC + medical morphology digital teaching platform + WeChat/QQ platform + questionnaire star survey" to guide the online teaching.

And according to the characteristics of the subject, special education is carried out: Changing the teaching mode of teachers unilaterally instilling knowledge through video, in order to strengthen student interaction and improve the "hands-on" experience, the application of a new flipped classroom teaching mode has been carried out. Through the use of Tencent Conference, Xuexi Tong Platform, WeChat and QQ platforms, the collaboration and interaction between teachers and students in the new online teaching mode has realized. This activity increased everyone's interest in learning, and enhanced everyone's learning ability and collaboration ability.

We have used the teaching method to make students have a sense of "ownership", changed the teacher's "self-improvement"mode, and better reflected the students' "self-study" skills and the teacher's "guided learning" and "accompanied learning" profound meaning. Experimental teaching of "Histology and Embryology" and pathology belong to the category of morphology, and both require microscope observation of tissue section specimens. The virtual experiment platform has the characteristics of convenient experiment operation, not restricted by time and place, repetitive operation, and conducive to students' familiarity and mastery of experimental knowledge (9). Through the screen-to-screen experiment teaching, the classroom teaching content is consolidated and the theoretical course is deepened.

The theme of the activity drawing competition: "teaching" as the leading, "learning" as the center, focusing on the cultivation of students' ability, especially the cultivation of imagination, innovating thinking ability and comprehensive quality, stimulating students' interest in learning, and promoting and enhancing the improvement of teaching quality.

Participating in the drawing competition not only consolidates students' learning and understanding of human morphology, but also improves students' mastery and integration of knowledge of anatomy, "Histology and Embryology"and "pathology", which is more conducive for students' acceptance and mastering the surgical professional theories and related skills. A theme event was held. While mastering professional knowledge, everyone also expressed their own perceptions about society. The epidemic is a "living teaching material". Through this theme activity, the teachers conducted a "Teaching" with warmth, and a profound ideological and political education of "patriotism, love for mankind, and love for medicine" were carried out at the same time.

Many students believe that in the face of COVID-19, it is necessary to use knowledge and science to solve problems, but also to hone their minds and skills to become a will, capable, and responsible medical worker. Everyone said that they would take the initiative to come forward when the country encounters difficulties in the future. This activity improved the students' literary expression ability and thinking ability, and also cultivated the students' medical and humanistic qualities.

The "Questionnaire Star" questionnaire data shows that the overall effect of online teaching is good, but 127 (52.05%) students in histology and embryology tend to return to offline classroom teaching after the epidemic, which may be different from the usual offline teaching. This may be related to the typical offline card test (select card, which contains essay questions, multiple choice questions, one of the noun explanation questions, and gives the correct answer at a given time) and the sliced-in test (two groups A and B look at PPT embryo pictures, give the answers and score the answers of 20 questions).

limitation:

First of all, online teaching requires students to stare at the computer, mobile phone or iPad for a long time, and it is difficult to concentrate. At the same time, there is a lack of school atmosphere and independent learning cannot keep up with the teaching progress (10). Secondly, online teaching is implemented throughout the country, and the network is sometimes congested, even some students have insufficient hardware at home and can only learn through the 4G network of mobile phones with insufficient traffic. Thirdly, classroom interactive teaching is not good. Some students use network resources to try to improve their own scores during the assessment, and the platform's supervision and management are not enough, resulting in formative evaluations that fail to fully and objectively reflect their own scores.

In addition, this study was carried out while exploring during the emergency situation of the epidemic, lacking a control group, and the evaluation only focused on the perception/satisfaction of

the network, rather than evaluating the actual changes in knowledge or skills (11). In addition, the tools used to evaluate the experience have not been validated, so we need longer-term research to evaluate the medium-term and long-term impact. Finally, this research lacks a rigorous sampling process, and all students in the class are included in our research.

Conclusions

In short, the online teaching of “Histology and Embryology” and “pathology” in one semester has a good effect, achieving the teaching purpose of “Suspension of Classes without Suspending School”. Under the new teaching mode we have established, online teaching is relatively traditional, and the content of the course is not reduced. However, the requirements for students have not been reduced. It has the advantages of more free time and place arrangements, a wide audience, and more choices. “Suspension of Classes without Suspending School” is not a complete replacement for classroom teaching in schools. It is just an emergency measure for the “Level I Response to Major Public Health Emergencies” (12). But for every teacher, this is a challenge and an opportunity, even a chance and an exercise opportunity. Everyone has mastered relevant skills and methods in the process of constant exploration and practice (10). The COVID-19 epidemic will have a profound effect on education for the foreseeable future (13).

Our teachers are the education reforms and the main force of development. We not only are teachers, but also are learners, researchers and innovators. The main task of teacher training and development is to organically combine teacher learning techniques with the use of timely techniques, so that they can actively and consciously participate in information age. In the educational reform of the modernization era, we have participated in the innovative construction of online teaching and explored new education models that combine offline and online to truly make technology an important carrier for the development of education (14).

Therefore, after the epidemic, we advocate the combination of online and offline teaching methods. This is a new trend. Students can better understand the value and significance of learning, and the learning methods are richer, which fully mobilizes students’ interest and subjective initiative, makes students become passive and active, and become the main body of learning. Meanwhile, teachers also need to change their teaching concepts, establish mutual “Internet + Education” thinking, learn to share and use big data, and better meet and serve the learning needs of students. Practice has proved that the development of this new teaching mode has not only successfully responded to the urgent needs of students for online teaching during this epidemic period, but also provided a theoretical foundation and experience summary for the future “Internet + Education” online and offline hybrid teaching.

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Competing financial interests

The authors declare no competing financial interests.

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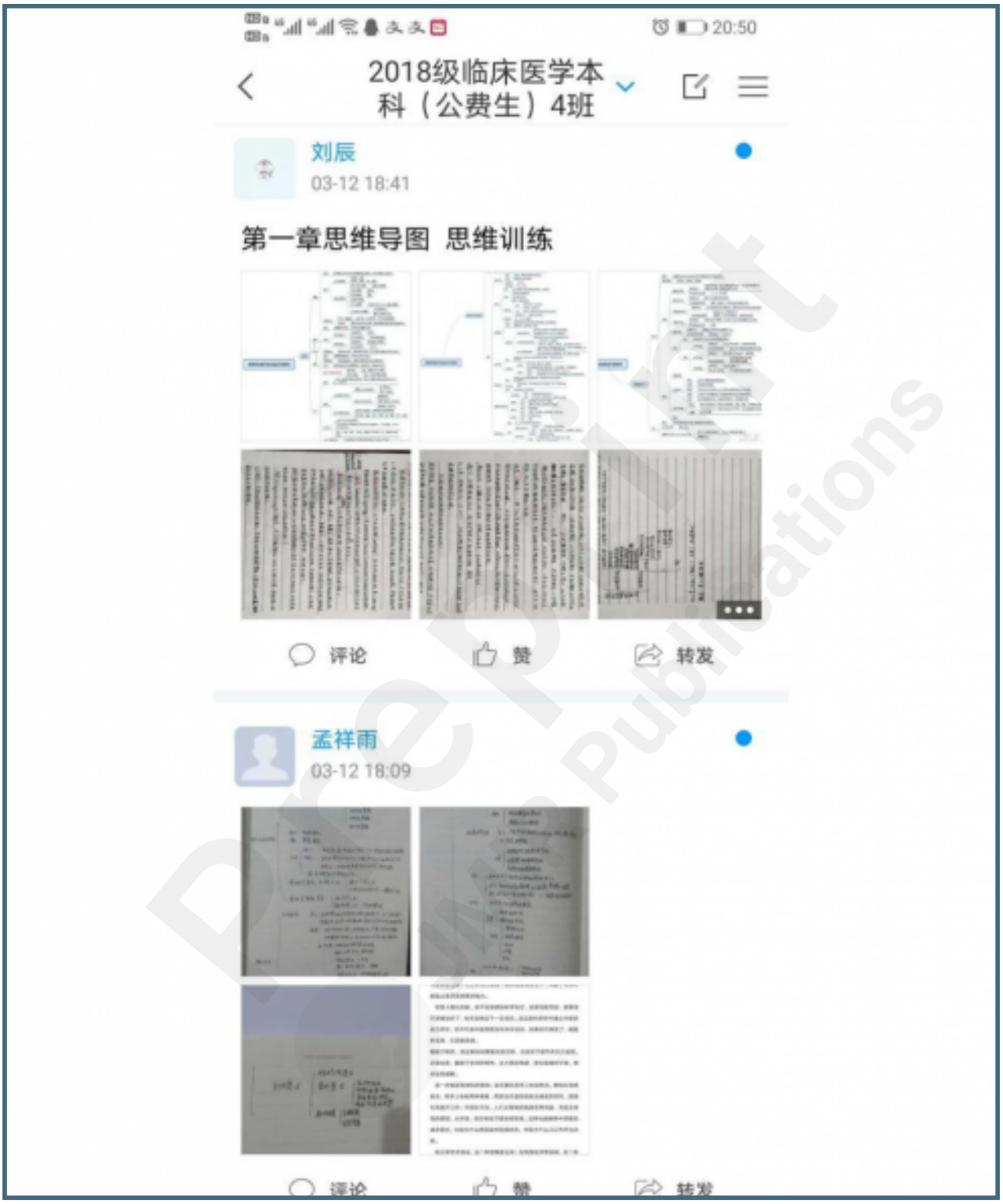
Supplementary Files

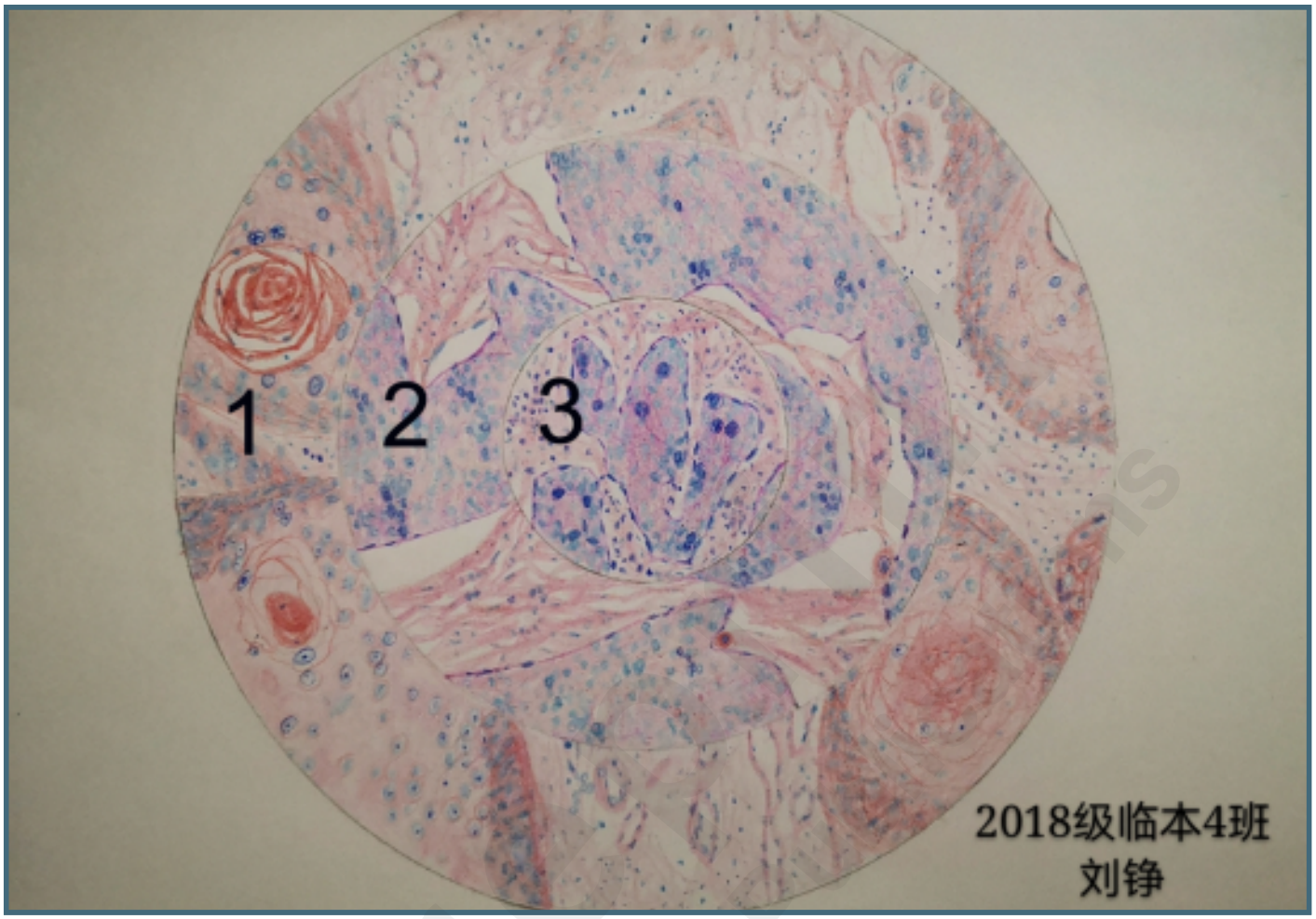
Figures

In the new flipped classroom, a student used the tencent conference for presentation.

Students are doing mind map exercise.



Representative image of squamous cell carcinoma at low (1), medium (2) and high power (3).

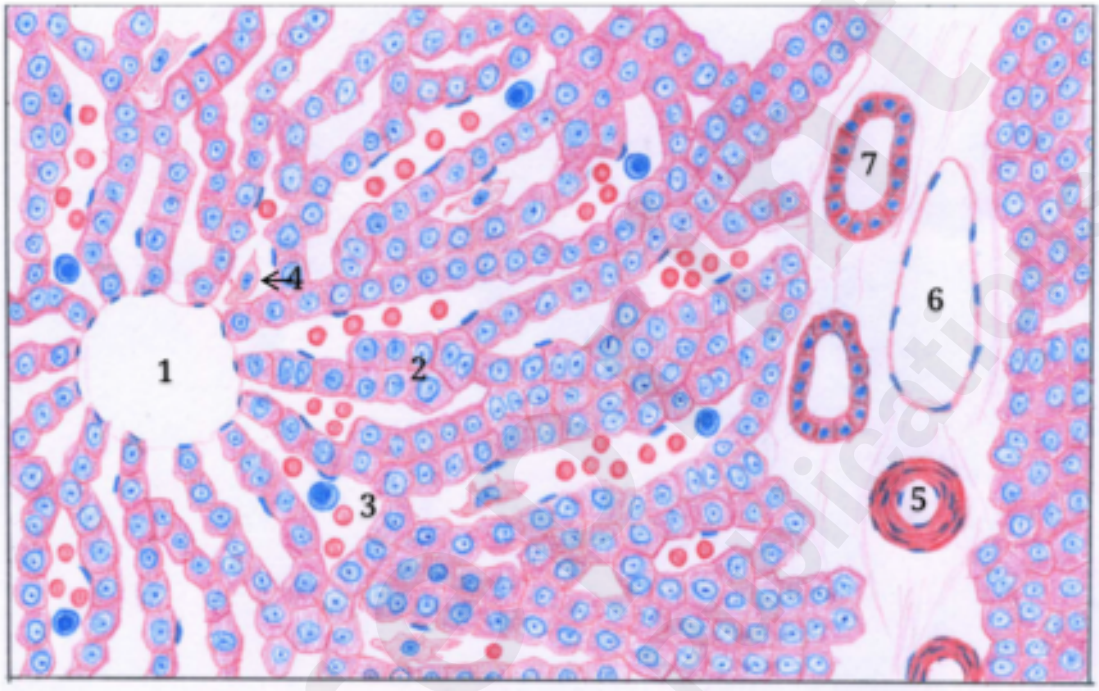


The winning work of the drawing competition-photomicrograph of healthy liver tissue.

高等医学院校首届大学生形态学绘图作品选

学校：山东第一医科大学　姓名：刘熙瑞　班级：2018 级临床医学本科 4 班

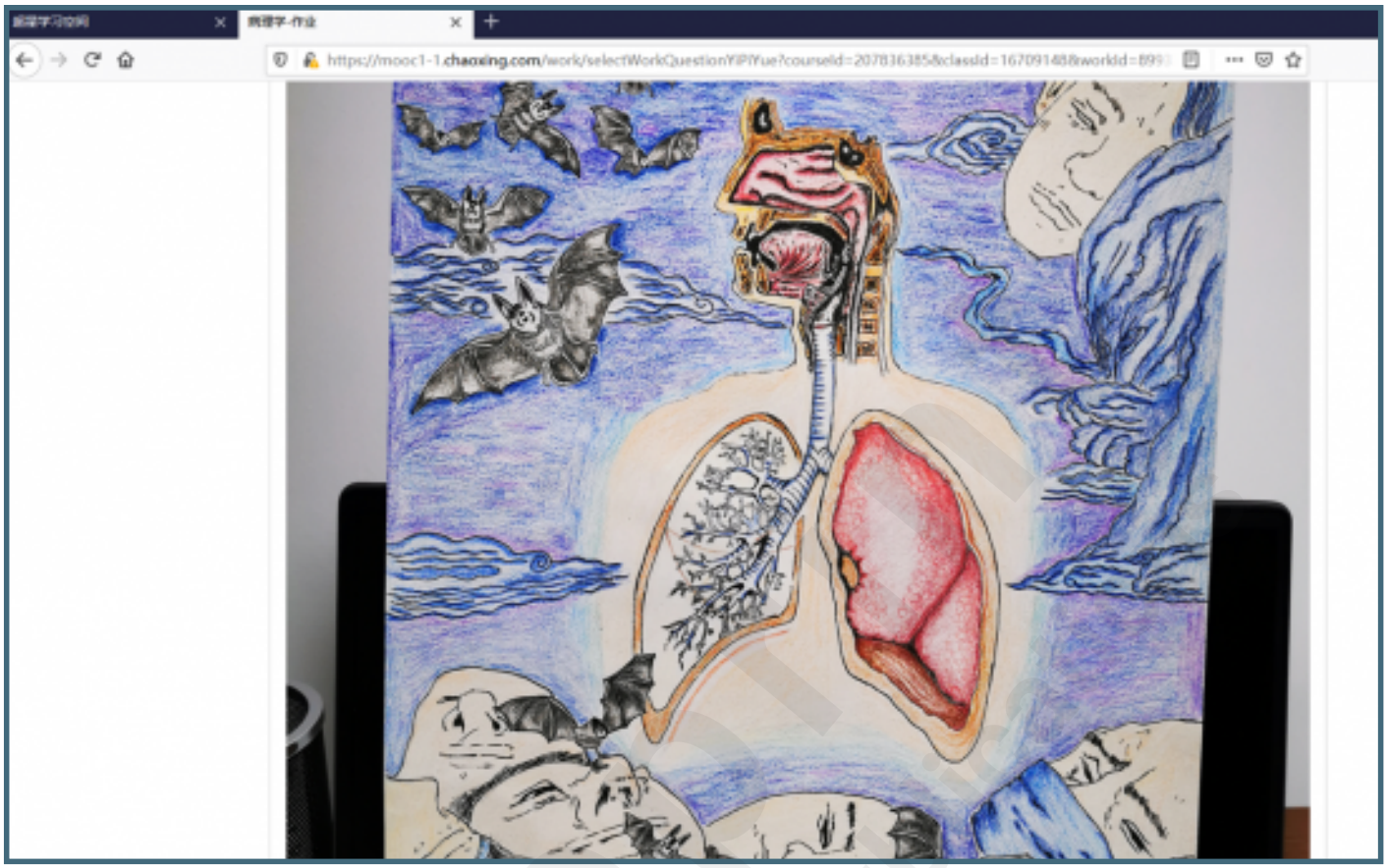
Monkey Liver HE stain 400X



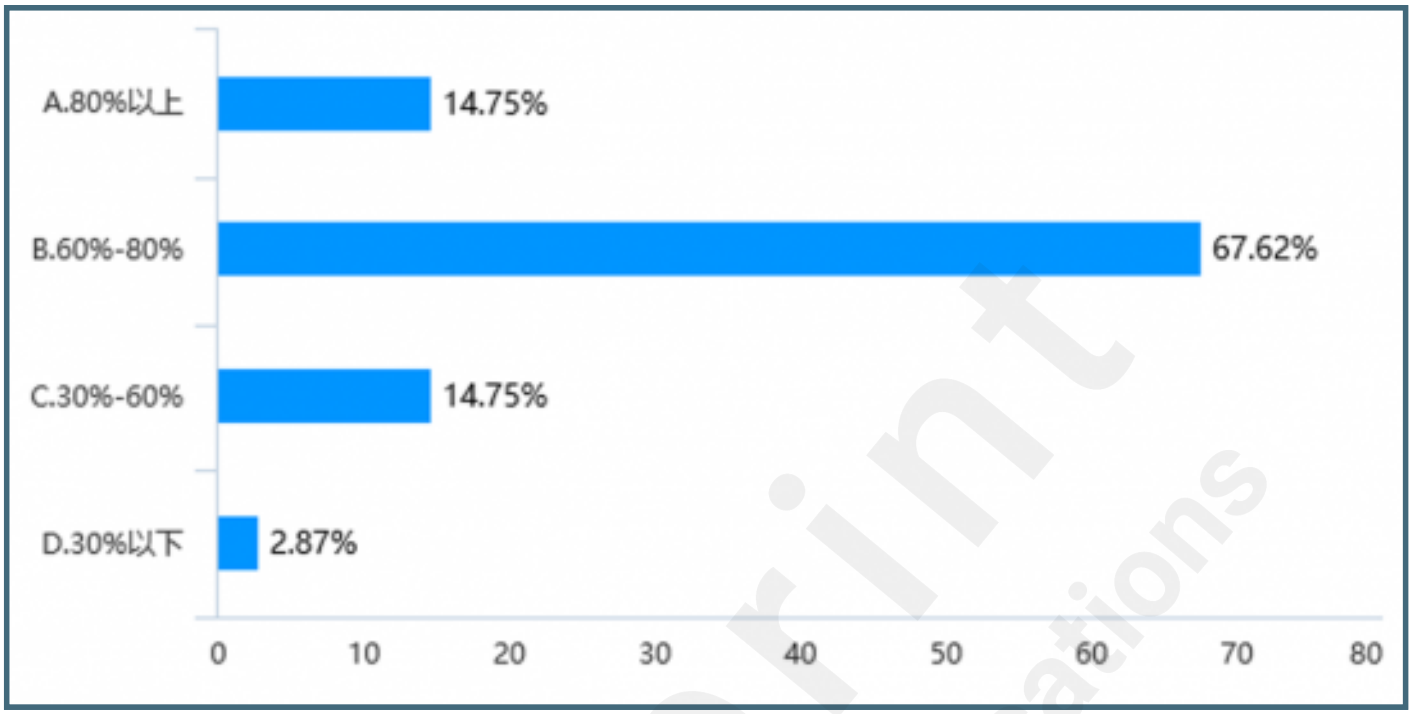
1.Central vein 2.Hepatic cord 3.Hepatic sinusoid 4.Kupffer cell

5.Interlobular artery 6.Interlobular vein 7.Interlobular bile duct

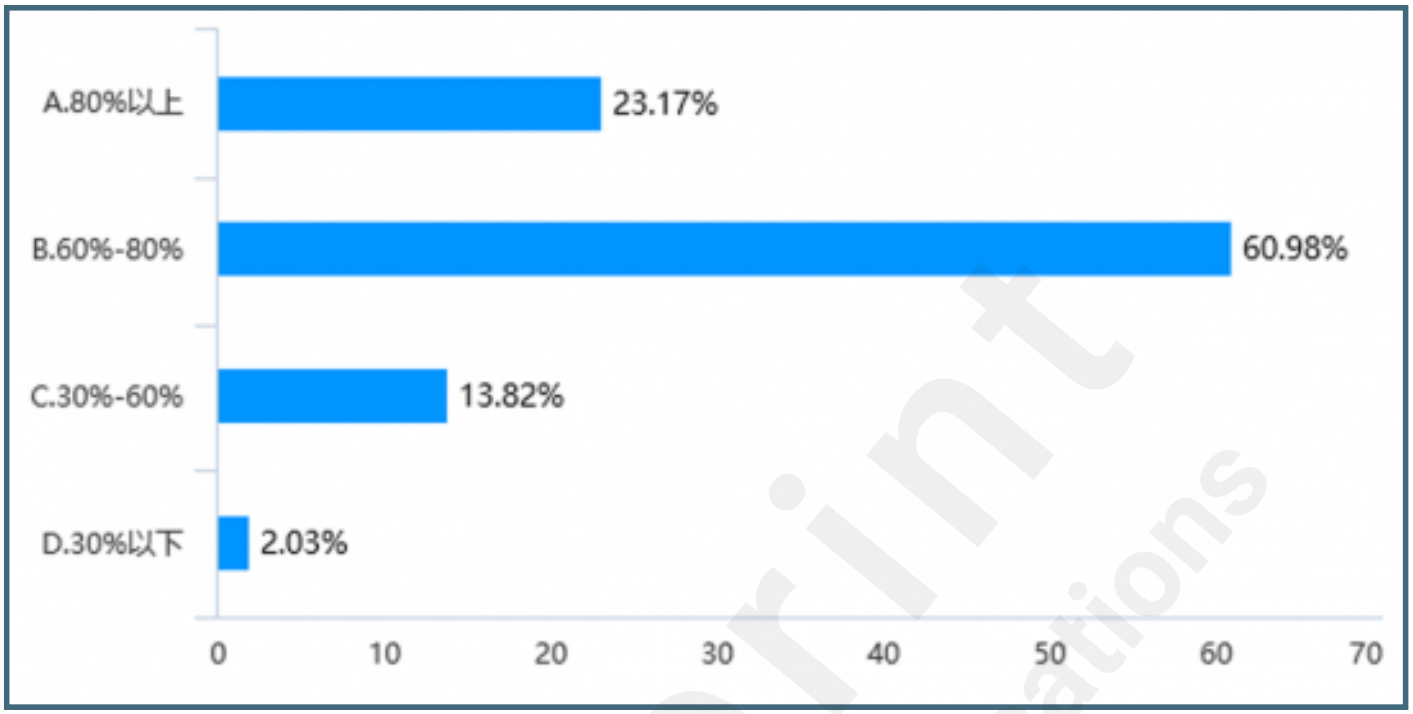
In the theme activities, the illustration was drawn by a student.



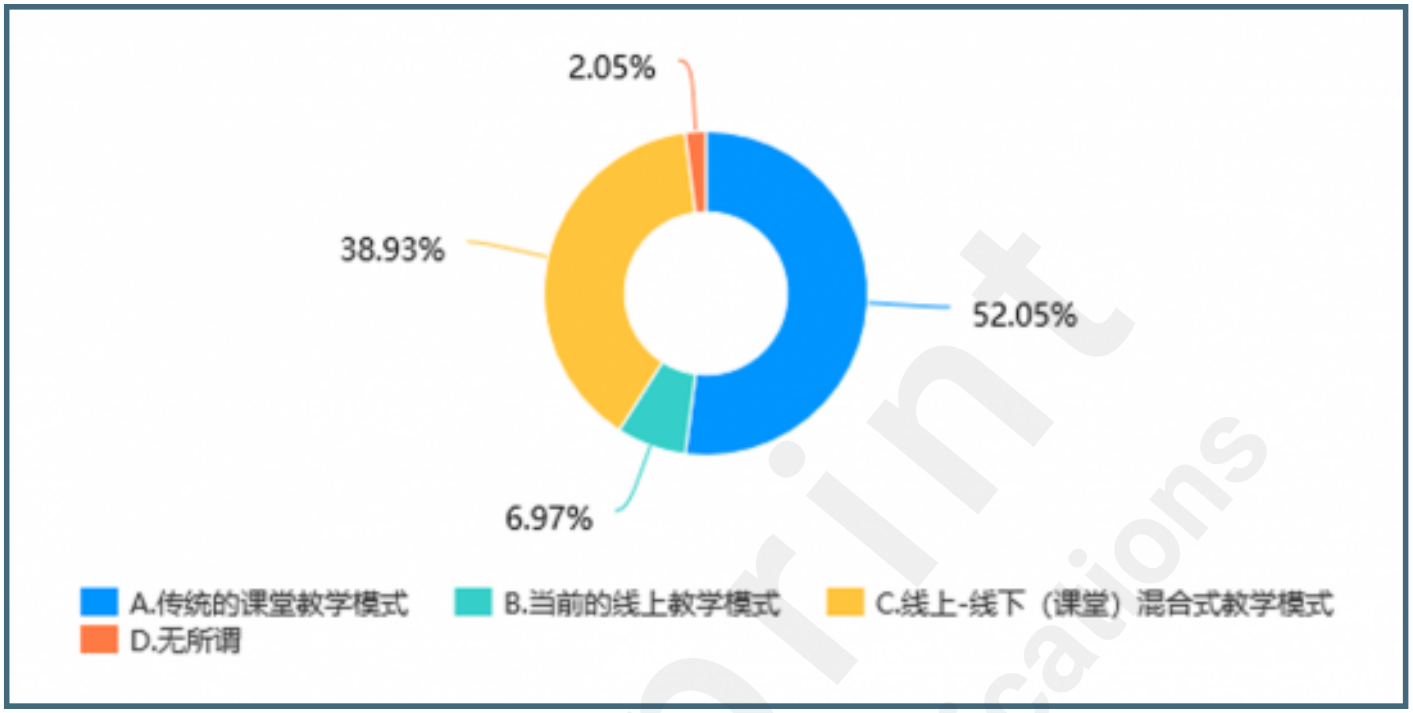
Percentage of people who can understand and master the theoretical knowledge learned through online learning of histology and embryology.



Percentage of people who can understand and master the theoretical knowledge learned through online pathology learning.



The pie chart indicates respectively the proportion of students choosing different teaching methods of histology and embryology including traditional offline teaching(A), nowdays online teaching(B), online and offline mixed teaching (C) and not care (D) after the epidemic.



The pie chart indicates respectively the proportion of students choosing different teaching methods of pathology including traditional offline teaching(A), nowdays online teaching(B), online and offline mixed teaching (C) and not care (D) after the epidemic.