

Differences of Neuroanatomy Education for Large and Small Numbers of Students in China and Korea

Diferencias de Educación en Neuroanatomía de Cantidades Mayores y Menores de Estudiantes en China y Corea

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SUMMARY: In Southern Medical University, China, 1,200 medical students study neuroanatomy every year, whereas in Ajou University, Korea, only 45 medical students study neuroanatomy. The considerable difference of student numbers results in differences in educational situations. The purpose of this study was to investigate desirable neuroanatomy education methods for large and small numbers of students. The situations of neuroanatomy education in China and Korea were compared systematically. With a questionnaire survey, positive comments and recommendations for their counterparts were collected from the medical students (168 Chinese and 41 Koreans) and anatomists (6 Chinese and 3 Koreans). By reviewing the opinions, the Chinese and Korean anatomists could learn from each other to improve their strong points and make up for the weak points. The results also disclosed the common problems of neuroanatomy education, which could be relieved by developing the fitting book and the self-learning tools, such as lecture videos and stereoscopic computer models.

KEY WORDS: Neuroanatomy; Education; Learning; Students; China; Korea.

INTRODUCTION

The Chinese authors in Southern Medical University and the Korean authors in Ajou University School of Medicine have visited each other several times to realize the remarkable differences between the two universities. In Southern Medical University, approximately 1,200 medical students learn anatomy every year; this large number of students is common in China (Statista, 2019). On the other hand, in Ajou University, only 45 medical students learn anatomy; this number is even smaller than average (85 medical students) in Korea (Korean Education Statistics Service, 2019). Naturally, the numbers of anatomists who teach the students in the two universities are very different, and their teaching situations are quite dissimilar to one another.

Through joint investigation, comparison of regional anatomy education between the two universities have been published (Dai *et al.*, 2018). The next interest was neuroanatomy education, because neuroanatomy differs from regional anatomy in its specific features, such as neuronal connections of the numerous pathways.

The purpose of this study was to search for desirable neuroanatomy education methods for large and small numbers of students. For the purpose, the situations for teaching and learning neuroanatomy in the Chinese and Korean authors' universities were compared; the medical students and teachers were asked to give their opinions on their counterparts' situations. Additionally, it was discussed how Chinese and Korean anatomists could improve their neuroanatomy teaching.

MATERIAL AND METHOD

The situations for neuroanatomy education in the two universities were investigated and compared (Table I).

The following four groups participated in the questionnaire survey voluntarily. Group 1 was 168 Chinese medical students. In Southern Medical University, about 1,200

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Fig. 1. Neuroanatomy education in China (left column) and in Korea (right column). Large and small numbers of medical students (1st row), slide lecture and board lecture (2nd row), lab practice (3rd row), permanent specimens in anatomy museum and temporary brain specimens (4th row), and self-developed neuroanatomy courseware and three-dimensional models (5th row).

students took the neuroanatomy course (Table I), whereas the other students (e.g., nursing students) learn about the nervous system in the systemic anatomy course. Among 1,200 students, 168 students volunteered for the survey. Prior to the survey, the approval of the university government was obtained.

In 2018, a Chinese author presented the situations of neuroanatomy education in the Chinese and Korean universities (Table I) with related pictures (Fig. 1) to the students (Group 1). The presentation was followed by free discussion. Successively, the students were asked “What seems good for the Korean situation?” “What is recommended for the Korean situation?” The students filled out the questionnaires in English without personal data such as name, sex, and age.

Group 2 was six Chinese teachers (3 professors and 3 lecturers) including the Chinese authors. The same presentation and questionnaire survey were done with the teachers.

Group 3 was 41 Korean medical students. Most students who finished the neuroanatomy curriculum volunteered for the survey (Table I). Prior to their participation, the proposed study was examined by the institutional review board (IRB) in the Ajou University School of Medicine. The IRB granted an exemption of deliberation (AJIRB-SBR-EXP-15-254).

In 2019, a Korean author demonstrated the situations of neuroanatomy education in the two universities to the students (Group 3) (Fig. 1, Table I). After

discussion, the students answered the questions “What seems good for the Chinese situation?” “What is recommended for the Chinese situation?”

Group 4 was three Korean teachers (2 professors and 1 teaching assistant) including the Korean authors. The same survey was done with the teachers.

Table I. Situations of neuroanatomy education for medical students in Chinese and Korean universities.

	Southern Medical University (China)	Ajou University (Korea)
Students	Approximately 1,200 students ¹	Approximately 45 students ¹
Teachers	10 professors, 5 lecturers, 6 technicians	5 professors ² , 1 teaching assistant
Course duration	6 weeks (together with other courses)	1 week (together with no other course)
Total lecture hours	27 hours	27 hours
Lab session hours	9 hours	5 hours
Lecture style	Slide lecture (80 %), board lecture (20 %)	Slide lecture (80 %), board lecture (20 %)
Lecture video	On-line (ID needed)	Both on-line and off-line (no ID needed)
Textbook	Textbook (self-produced) ³	Printed lecture slide
Medical terminology	Chinese (80 %), English (20 %)	English (90 %), Korean (10 %)
Lab practice style	Dissection, observation	Observation
Students per a lab session group	30 students	15 students
Supplementary materials	3D models (commercial)	3D models based on sectioned images, neuroanatomy comics (non-commercial, self-produced)
Exam	Multiple choice quiz (60 %), description quiz (20 %), specimen picture quiz (20 %)	Multiple choice quiz (80 %), description quiz (10 %), specimen picture quiz (10 %)

¹Numbers are bigger than the entrance quotas because of the students who retake the neuroanatomy course.

²Professors includes anatomist, physiologist, biochemist, and neurologist.

³Textbook is distributed to students without profit (Hua, 2018).

⁵Three-dimensional models made from the sectioned images of cadaver heads can be obtained from anatomy.co.kr free of charge.

RESULTS

The major opinions of the students and teachers about their counterparts' situations were summarized in Tables II and III.

Among the opinions, only the recommendations for counterparts were summarized in the Results section, because the recommendations for Korean situation were closely related with the positive comments for Chinese situation; and vice versa. Instead, both the positive comments and the recommendations were mentioned in the Discussion section.

1. Recommendations for Korean situation (Table II)

The Chinese students and teachers were concerned with only a one-week neuroanatomy course in Korea (Table I). The short course resulted from the atmosphere that the Korean university views the block lecture as a current education trend. The Chinese thought that neuroanatomy knowledge needs to be reinforced during a long course. Additionally, more lab hours are suggested for understanding the brain morphology.

Table II. Opinions of the Chinese students and teachers about the Korean situation.

	Positive comments for Korean situation	Recommendations for Korean situation
168 Chinese students + 6 Chinese teachers	Abundant cadaveric specimens enable minute observations by students. (125 + 2) Small number of students yields high learning efficiency. (101 + 2) Comics improve students' memorization and interest. (45 + 1) Browsing software and 3D models help stereoscopic understanding. (40 + 1) Board lecture videos enable self-learning. (41 + 0) Board lecture with schematic drawings helps general understanding. (33 + 2)	More course weeks are needed for deep understanding of the subject. (73 + 1) Commercial 3D computer models should be used for convenient observation. (51 + 1) Conventional book should be used for precise information. (30 + 2) More lab hours are needed for understanding actual morphology. (28 + 1) More description quizzes are needed. (20 + 2) More teachers are needed. (21 + 0)

(Repeated number of the Chinese students' opinions + that of the Chinese teachers' opinions).

The Chinese recommended the use of commercial three-dimensional (3D) models. Even though the self-produced 3D models by the Korean authors have their merits, including sectioned images and free distribution (Chung & Chung, 2019), the Korean students might benefit from the commercial 3D models equipped with the advanced functions.

The Chinese suggested the conventional book rather than the printed lecture slides. A solution might be for the self-produced textbook to include the concise information fitting the short course hours in Korea.

2. Recommendations for Chinese situation (Table III)

The Korean participants' major concern was the large

number of students and the relatively small number of the teachers in China (Table I). Increasing the number of teachers is the fundamental solution; however, the university would not permit it for financial reasons. Other methods (e.g., self-learning materials) should be considered to overcome the insufficiency of teachers.

The Koreans emphasized the English terminology, because the Chinese students would read English books and journals after graduation. They did not mean to abandon the Chinese terminology, but to learn both terminologies.

Koreans suggested having an intensive neuroanatomy course without other courses. The Korean opinion was opposite to the Chinese opinion that a long neuroanatomy course with other courses is desirable.

Table III. Opinions of the Korean students and teachers about the Chinese situation.

	Positive comments for Chinese situation	Recommendations for Chinese situation
41 Korean students	Brain dissection by students improves their understanding and memorization. (27 + 1)	Having so many students lowers the concentration on lecture. (24 + 2)
+ 3 Korean teachers	Learning neuroanatomy for a long period along with collateral courses is helpful for holistic understanding. (11 + 2)	For abundant students, there must be more teachers. (23 + 2)
	Lab sessions with longer hours yield better understanding of brain structure. (11 + 2)	English terminology should be taught more for international communication. (21 + 3)
	Many lecturers and technicians in a lab session are helpful for novice students' understanding. (9 + 3)	Learning neuroanatomy in a short course without collateral courses can increase the concentration on the subject. (18 + 1)
	Thanks to having many teachers, students can learn diverse perspectives. (10 + 1)	Supplementary learning materials besides the commercial ones enable reviewing of the lab session. (8 + 2)
	Brain specimens in the museum inspire students about neuroanatomy. (8 + 2)	Board lecture with schematic drawings will help concrete understanding. (5 + 2)

(Repeated number of the Korean students' opinions + that of the Korean teachers' opinions).

DISCUSSION

In this report, neuroanatomy education for 1,200 Chinese medical students and that for 45 Korean medical students have been compared (Fig. 1) (Table I). The opinions of the students and teachers on the two education situations were gathered (Tables II and III).

It is difficult to decide which of the two nations' educational methods is more desirable, for the following reasons. First, between China and Korean, there are social and cultural gaps in people's values. Second, the two nations and two universities have different educational philosophies and goals (Dai *et al.*).

The differences between the two counterparts should be recognized. One is the different number of students who were learning neuroanatomy. In Korea, the small number

enabled the students to receive individual care from the teachers and pay high attention in lectures or lab practice (Tables I and II). In China, the large number increased the diverse styles of lab practice, such as the anatomy museum (Fig. 1), as well as the diverse perspectives of learning from many teachers (Tables I and III).

Another is the different durations of the neuroanatomy course. Some Korean students and teachers preferred their own short course without collateral courses, because it might be beneficial for intensive learning to have no distraction. Other Koreans preferred the counterpart's long course duration with collateral courses, because it might be beneficial for students' brain dissection, integrated understanding, and long-term memorization (Tables I and III). This topic should be further discussed by various

educators and education theorists (Peterson & Tucker, 2005).

The results of the present study disclosed the objective problems of neuroanatomy education in both nations (Tables II and III). For these problems, both extrinsic and intrinsic solutions are to be considered.

The extrinsic solutions can be tried by the responsible persons outside anatomy department. Examples are for the appointed professors of the university to adjust the neuroanatomy course schedule, to increase the number of anatomists, or to build an anatomy museum. A job of the anatomists is to persuade them to do so for the sake of the students' learning. The results of this research and other investigations would be helpful data for such persuasion.

On the other hand, the intrinsic solutions can be tried by the anatomists themselves. An intrinsic solution is the fitting book. The printed lecture slides used in Korea cannot provide the students with systemic, comprehensive, and precise information. Replacing the slides with a conventional neuroanatomy book (Table II) might still create a big problem, because the conventional book is overwhelming in size and difficulty. It decreases the students' interest and even causes neurophobia (Giles, 2010; Javaid *et al.*, 2018).

Therefore, the Korean authors decided to make an alternative neuroanatomy book based on their experience in making a regional anatomy book (Chung *et al.*, 2020). The neuroanatomy book will contain the concise information appropriate for the novice students, the schematic drawings of neuronal connections to help them understand, and the comics to improve their memorization and interest (Park *et al.*, 2011; Kim *et al.*, 2017). It is hoped that this book in English will be used by the Chinese students either directly or after Chinese translation.

The other intrinsic solution is the self-learning materials. First is the lecture video on neuroanatomy. Both the Chinese and the Korean universities have produced the lecture video that is preferentially used by students (Tables I and II) (Park & Chung, 2006). In addition, the lecture video on neuroanatomy lab practice (e.g., explanation of the brain specimens) can be manufactured to facilitate enough lab practice in the limited time. It would be best if the lecture video corresponds to the textbook and lab-practice manual.

Second is the 3D models of the brain and its virtual dissection software. The Korean authors have made the software that deals with the surface and volume models of the head, including the brain from the cadaver's sectioned images, and have distributed the software free of charge (Fig.

1) (Shin *et al.*, 2012; Chung & Park, 2019). The free software and the commercial software equipped with the advanced functions complement each other (Chung *et al.*, 2015; Chung & Chung, 2019).

From the comparison between the two different situations, a change of concept can be made. For example, the Chinese authors have thought that the enormous number of students is an obstacle to their research activity (Table I). However, during the present study, the Chinese authors began to realize that their situation could be the source of research for educational methods, teaching materials, and pedagogic systems (Dai *et al.*).

This report shows the different situations of neuroanatomy education and the responses of students and teachers to the situations. By reviewing them, the Chinese and Korean anatomists can learn from their counterparts to improve their strong points and overcome their weak points. This study is expected to be useful information for other anatomists to establish their neuroanatomy-teaching methods appropriate for either large or small numbers of students.

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RESUMEN: En la Universidad de Medicina del Sur, China, 1.200 estudiantes de medicina estudian la neuroanatomía cada año, mientras que en la Universidad de Ajou, Corea, solo 45 estudiantes de medicina estudian neuroanatomía. Esta considerable variable del número de estudiantes resulta en diferencias en las situaciones educativas. El propósito de este estudio fue investigar métodos de educación en neuroanatomía deseables para cantidades mayores y menores de estudiantes. Se compararon sistemáticamente las situaciones de educación en neuroanatomía en China y Corea. Por medio de una encuesta por cuestionario, se obtuvieron comentarios positivos y recomendaciones para sus contrapartes de los estudiantes de medicina (168 chinos y 41 coreanos) y anatomistas (6 chinos y 3 coreanos). Al revisar las opiniones, los anatomistas chinos y coreanos podrían aprender unos de otros para

mejorar sus puntos de fortaleza y compensar los aspectos débiles. Los resultados también revelaron los problemas comunes de la educación en neuroanatomía, que podrían aliviarse desarrollando el libro de adaptación y las herramientas de autoaprendizaje, como videos de conferencias y modelos de computadora estereoscópica.

PALABRAS CLAVE: Neuroanatomía; Educación; Aprendizaje; Estudiantes; China; Corea.

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