TIPS, TRICKS & TECHNIQUES

How Can Human Beings Live beyond 100? A Freshman Seminar Course on Aging

JIANYING SHAN, JIE SHEN, MOTAO LI, DAKE ZHANG, AND XIAOHUI ZANG

Abstract

How aging might be delayed is a very meaningful topic. Our "Living Beyond 100" freshman seminar course combined lecture-based and seminar-style instruction on the following subtopics: "Social Geography and Longevity," "The Process of Brain Aging," "Anti-aging Biology," "What If We Could Live beyond 100 Years?," "Reexamination of Regeneration and Replacement," "Comprehensive Research on Cancer," and "Information and Immortality." The course introduced knowledge on the frontiers of scientific research, helped students understand deeply how humans age and how life span can be prolonged scientifically, and encouraged students to choose healthy habits and establish a good life philosophy. The course also helped freshmen change from a passive learning mode to an active one, improved their scientific literacy, and cultivated their skills of innovation and communication.

Key Words: *freshman seminar; aging; active learning.*

○ Introduction

In freshman seminar courses, students conduct research on a topic in a group mode with the teacher, have group discussions guided by the teacher, and develop their oral argumentation and writing skills (Gordon & Grites, 1984). Freshman seminars have a long history, and many world-renowned research universities, such as Harvard and the University of California at Berkeley, have been offering such courses for decades (Davis, 1992; Barefoot & Fidler, 1996; Phillips et al., 2008). But in China, freshman seminars are still new.

How can humans live beyond 100 years of age? Our "Living Beyond 100" freshman seminar course focused on how humans get old and how to extend life span as well as health span. The course combined lecture-based and seminar-style instruction. It aimed to promote students' curiosity and interest in learning, train students in the basics of research and communication, and cultivate students' ability to innovate (Franklin et al., 2003; Cloud-Hansen et al., 2008). In terms of teaching methods, the course emphasized teacher-student interaction, highlighted the scientific research characteristics of teaching and training, and cultivated students' spirit of criticism and exploration (Budny, 2001). The goals of the course were to help students understand deeply how humans age and how to prolong life expectancy, thereby enabling students to choose healthy habits and establish a good life philosophy. The course also aimed to help freshmen change from a passive learning mode to an active one, allowing them to experience the free academic atmosphere of a university, improving their scientific literacy, and cultivating skills of innovation and communication (Shanley and Witten, 1990).

The "Living Beyond 100" freshman seminar course received enthusiastic responses from students. The course, they said, helped them realize that teachers are not an absolute authority, that they should not just passively learn the knowledge accumulated by their predecessors, and that they can raise their own questions. The course also helped eliminate the mysteriousness of scientific frontiers for students and greatly improved their initiative to conduct research. Many students found that they experienced the joy of learning in this seminar course, which undoubtedly set a very good start for their future research.

○ Student Selection & Organization

In order to ensure the effectiveness of the group discussion, the maximum number of students to sign up for this course was limited to 60, and 30 students were selected after interviews (Hoff, 1996). The selection criteria included interest in biology, prior experience in biology, English reading ability, Chinese writing ability, and communication skills. In addition, the teacher tried to balance the factors of majors and nations among the students, and tried to increase the diversity of the student background under the premise of fairness. Students enrolled in this course were majoring in computer science, electronics, economics, foreign languages, humanities and law, network security, materials, environment, medical instruments, etc. Most of the students were of the Han

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ethnicity, but there were also students belonging to the Uyghur, Miao, and Sui ethnic minorities. After the first class, the 30 students were asked to form fixed groups of five in which to participate in the subsequent classes. Because students from the same majors or ethnicities tend to stay together, the students were asked to pick group members with the most possible diversity. The teacher did not assign the groups but gave advice on how to maximize diversity in all groups. The purpose was to promote intermajor and intercultural communication.

○ Course Design

The course structure was based on seven academic lectures, seven thematic seminars, and final reports. Each lecture brought different scientific and intellectual impacts to the freshmen, and then, at the end of the lecture, the teacher assigned as homework a set of scientific questions related to the lecture content. The students used the library and internet resources to complete the assignment, doing group research and writing survey reports under the guidance of the teacher via an online chat board. In the next class, the teacher organized a thematic seminar, in which the student groups reported their findings, and guided the students to use scientific thinking in their discussion of scientific issues and to organize debates when necessary. Finally, after in-depth discussion of the survey data, the students reached a reasonable conclusion with the help of the teacher. The emphasis of the teacher's guidance was on helping students gather a comprehensive body of scientific literature and making sure that they addressed questions by using scientific evidence on all aspects and drew conclusions in a logical and objective way. The teacher also commented on the students' work to help them improve their scientific thinking.

The reciprocal structure of the seven rounds of "academic lectures + thematic seminars" was designed to train students' thinking ability and self-learning ability. Most of the students who actively cooperated demonstrated improvement in those abilities; as the course progressed, their reports presented scientific evidence more comprehensively and they arranged their speeches in a more logical and objective way during the seminar discussion. The research and discussion tasks gave students experience in literature review, data collection, and the evaluation of scientific investigations; exercised their analytical thinking ability; and enhanced their interest in the course (Andrews et al., 1993; Jensen, 2011). The main subtopics the students explored are described below.

Social Geography & Longevity

What factors hinder humans from living beyond 100 years? Are the relevant factors genetic, geographic, ethnic, social? Do they include disease and other environmental factors? The teacher introduced the basic concepts of life span and health span and led the students in discussing the impacts on average life expectancy of social relations, regional influences, natural disasters, diseases, and other aspects.

The Process of Brain Aging

What is the normal aging process of the brain as it enters old age? How does the brain actively adapt to the process of aging? What implications does the current research have for improving and optimizing human memory?

Anti-aging Biology

Why is our body aging? What kind of efforts can we make to influence this process? What are the factors that affect our aging? The teacher led students in a discussion of the causes of aging. How do cells mature and age? What are the characteristics of gene mutations in aging? How can we retain vitality, ensure physical health, and improve our quality of life? The teacher guided students in exploring the theories of aging and the challenges of aging research.

What If We Could Live beyond 100 Years?

Can we live to 100 years of age and beyond? If so, what will our quality of life be like at such an advanced age? How well will our memory function? What is the definition of longevity? What is the HeLa cell line and how is it used in scientific research? What is telomerase and what effect does it have on the human body?

Reexamination of Regeneration & Replacement

What are adult stem cells? What are embryonic stem cells? What is the significance of the extracellular matrix for human health? How are stem cells extracted and how do they combine with the matrix to accelerate wound healing? What advances have humans made in transplantation, regeneration, matrix, fiber fabric, and other technologies? How can medicine, engineering, and science be combined to promote hardware upgrades and applications that will aid in medical progress?

Comprehensive Research on Cancer

What is cancer? What factors can cause cancer? What are the roles and relative importance of the gene, the environment, and lifestyle? The teacher led students in a discussion of the latest research on various cancers, including cancer prevention, diagnosis, and treatment.

Information & Immortality

What are the differences between humans and robots? Will the rapid advancement of information technologies enable human beings to live beyond 100 years of age in the future, with the aid of artificial intelligence? Can humans achieve the continuation of life through intelligent robots?

○ Discussion & Implications

In the first class session, the teacher asked each student to introduce himself or herself, including geographic and ethnic background, major and interests. The students were also asked to tell why they chose this course and how they think humans might live beyond 100 years of age. This process helped the teacher evaluate the students' knowledge, interests, and opinions, so as to determine the appropriate depth and way of introducing knowledge in class. This understanding of the students' backgrounds could also inform the teacher's approach to deepening students' understanding of scientific research by arranging laboratory visits and experimental observations (Dabbour, 1997).

The teacher paid attention to the diversity of majors, regions of origin, and ethnicities when selecting the students for the seminar, and required the students to have an open attitude toward new

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ideas and to be ready to doubt any opinions. The teacher also encouraged students to listen to teachers and other students, and to not be afraid to make mistakes in sharing personal opinions. A Uyghur student, with the encouragement of the teacher, overcame his language barrier and introduced to other students the unique living habits of Uyghurs that have a possible connection with longevity, which aroused great interest among the other students. A student of the Miao ethnicity introduced a special food of that culture: the digested food from a cow's stomach. The Miao believe that this food is good for health and longevity, which surprised the teacher and other students. One student talked about the film *Interstellar* and the concept of the "wormhole," and expressed a belief that future advances in physics could help humans slow down aging in a magical way. Overall, the differences in background of the students helped the seminar course to be carried out enthusiastically. The progress of the course increased the students' knowledge and made the students more and more familiar with each other. Mutual appreciation and encouragement increased students' confidence and made them more open to expressing opinions in the classroom.

The teacher also encountered challenges during the course. First of all, as freshmen, the students felt that their knowledge was not rich enough, and they were afraid that their opinions might be wrong at the beginning of the course. In response to this, the teacher encouraged the students to speak by rewarding extra points in final grades, and told them that it was not necessary to be correct, which helped create an atmosphere of free expression; the teacher was also careful not to comment immediately after each student's speech, and comments and corrections were never targeted toward a single student. Second, students didn't know how to start a discussion at the beginning: either they didn't dare to argue or they argued rigorously with no evidence. In response to this, the teacher told them that discussing scientific issues was not a matter of personal attacks; the purpose of the debate was to help promote thinking about scientific questions, and the arguments should be based on proven facts or logic. Thus, a free academic atmosphere was formed to encourage students' active involvement and stimulate their initiative in learning. As the seminar moved forward, less prompting by the teacher was needed as students became more active.

The teacher found that basing the lectures on relevant new scientific findings, clips of science documentaries, and the teacher's own research results was very helpful in delivering the key concepts. Providing students with extracts from relevant literature and commenting via the online chat board during their preparation for the seminar discussion was helpful as well. For example, during work on the topic "Social Geography and Longevity," the teacher showed her own animal research data to students to help introduce the concepts of life span and health span. The teacher also provided video clips from documentaries showing contrary findings from different regions, and asked students to prepare the discussion on social and geographic factors. In this process, the teacher made sure that the students looked at literature on multiple factors comprehensively, and guided them to realize that longevity was not determined by a single factor. Similarly, during work on other topics, the teacher used multiple resources to lead students toward formation of a scientifically sound conclusion. Of course, expression of different viewpoints and debates were encouraged in order to help students draw the conclusions through their own discussion.

Students' feedback on peer performance was included in the grading in order to encourage students' active participation in the course. The students were asked to give a grade to each individual for the final presentation. To promote fairness within each five-person group, the students were also asked to provide ratings inside the group, on each other's efforts in literature review and topic preparation. The teacher gave grades based on how many times each student spoke, how well they expressed scientific opinions, and their performance on the final presentation. The teacher's grades composed 60% of the final grades, and the scores given by students composed 40%. The scoring standard was announced at the beginning of the course.

In this course, we found that it is important to make a good choice of theme topics. It is exciting to start with a fascinating story and gradually guide students to explore the relevant scientific questions. It is best to make flexible adjustments of theme topics according to the students' responses during the teaching process, so that students who have just entered the university and are in different majors can actively participate in the discussion. In the future, we will conduct long-term explorations on how to optimize the theme topics and how to present them to best attract students' interest and thus enhance their involvement in the discussion.

The following examples of students' positive responses indicate satisfaction with this freshman seminar:

- "I learned how to search and read English literature, analyze and present data. These all increased my self-confidence."
- "From this class, I learned that an open mind about new knowledge is very important."
- "The teacher is kind and humble. Not only did this course enhance our self-confidence, but we also have a new understanding of learning and learners. Knowledge is from research and is infinite."
- "The knowledge accumulated by predecessors should not just be passively absorbed. It can also be questioned."
- "The freshman seminar taught us that the frontiers of science are not far away from us."
- "We experienced a new way of learning. We learned how to express our own views, learned the way of thinking from multiple angles, and learned how to judge by scientific evidence."
- "I learned that the original aging science research is done in this way. I hope that there would be opportunities to participate in research of interest in the near future."

○ Conclusion

Our experience in this seminar course showed us that aging is a very attractive theme for freshmen. The course introduced students to the frontiers of science on aging and longevity, while improving their independent learning ability and oral communication skills. The course was designed to enhance students' interaction and cooperation, to stimulate their desire for knowledge in a field previously unknown to them, and to promote teamwork and logical

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thinking. The course also helped freshmen change from a passive learning mode to an active one, enabling them to experience the free academic atmosphere of a university.

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