Exploring Innovations in the Undergraduate Tutorial System Paradigm in the Era of Mega Science

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Abstract: Higher education aims to cultivate well-rounded individuals with both moral character and outstanding capabilities. The implementation of a tutorial system for undergraduate students is considered as a viable approach to achieve optimal outcomes. In the era of mega science, where technology continuously innovates and empowers higher education, new possibilities emerge for the implementation of the tutorial system. Although many universities are currently exploring the tutorial system, a standardized paradigm has yet to be established. Drawing upon five years of experience in operating the tutorial system at our university, this study focuses on the management aspects of the system through a questionnaire survey. Specifically, it delves into the overall institutional framework and daily management practices. Furthermore, in-depth analysis is conducted on the timing, frequency, and guidance content of tutorial activities to innovate and establish a paradigm that enhances the institutional mechanisms of the tutorial system. By doing so, this research aims to explore the operation of the tutorial system in the context of the "era of mega science" and to reshape undergraduate education and the broader field of education as a whole.

Keywords: Tutorial System; Paradigm; The Era of Mega Science

1. Research Background

Universities serve as crucial bridges between academic institutions and businesses [1], placing talent cultivation at the forefront of their responsibilities. Talent development is a comprehensive endeavor that encompasses various elements such as the ideology, subjects, objects, goals, approaches, models, and institutions [2]. In the context of the "era of mega science", where information proliferates and tools and methods are advanced, students have easier access to knowledge, while teachers find it more manageable to organize and guide them. Furthermore, the post-2000s generation exhibits greater clarity in their aspirations, thus having a more distinct sense of the goals of university education. Therefore, one of the key concerns in higher education today is how to effectively utilize the advantages of the "era of mega science" to cultivate high-quality talent.

According to the China Newsweek, by 2035, the number of students enrolled in compulsory education in China is projected to decrease by 30 million. In the future, China's compulsory education will undoubtedly undergo a shift towards smaller class sizes and enhanced quality. With a decline in the birth rate and a corresponding decrease in the number of students entering compulsory education, as well as the ongoing selective placement through the secondary school entrance examination, regular higher education also faces challenges. Thus, the key lies in continuously improving the quality of higher education to provide society with highly competent and capable individuals. In recent years, especially following the issuance of the Guidelines for the Construction of Ideological and Political Education in Higher Education by the Chinese Ministry of Education in 2020, universities have placed increased emphasis on assisting students in shaping their correct worldview, outlook on life, and values. The implementation of the undergraduate tutorial system serves as a vital pillar for universities to achieve their goals of both teaching and character development, playing a prominent role in improving the quality of undergraduate education [3,4].

2. Empowering Higher Education in the Era of Mega Science

2.1 The Essence of "The Era of Mega Science"

The "Era of Mega Science" encompasses various dimensions, including unconventional science, large-scale technological systems, highly complex structures, and comprehensive national science and technology systems [5]. This era is characterized by a market-driven approach, with a focus on corporate technological innovation, diversified investments, and a more comprehensive and in-depth exploration, both in terms of technology and theory.

2.2 Opportunities Arising from "The Era of Mega Science"

2.2.1 Technological Socialization

Technological socialization manifests as the accelerated penetration of technology into various aspects of social life [6]. Many technologies are no longer exclusively reserved for professionals but have become more accessible to the general public. For instance, the artificial intelligence chatbot application "ChatGPT" developed by OpenAI, commonly referred to as a "content rewriter" or a "superbrain", effectively helps individuals filter out the noise caused by vast amounts of data and enhances productivity. Such advancements hold immense potential for widespread applications in the field of education and pedagogy.

2.2.2 Demand-Driven Collaborative Innovation

The "Era of Mega Science" encourages individuals to think boldly, act fearlessly, possess quick thinking abilities, exhibit unity, and demonstrate strong adaptability to handle and solve new challenges. Its core focus lies in fostering students' abilities for independent thinking and problem-solving, respecting their individuality and emphasizing the cultivation of ethical qualities. Moreover, this educational approach also emphasizes the holistic development of students, including their psychological well-being and character traits.

2.3 Empowering Higher Education Through Technology

2.3.1 Learning Extending Beyond University Boundaries: Customized Master Courses

In China, online learning platforms led by Chinese MOOC (Massive Open Online Course) have revolutionized the learning landscape. As of the end of February 2022, there were over 50,000 MOOCs available, attracting nearly 800 million course enrollments, and granting over 300 million course credits to enrolled students. Both the number of MOOCs and the number of learners rank first worldwide, displaying a continued trend of rapid growth. Additionally, platforms such as "NetEase Open Course", "Zhihuishu", and "Bilibili" have gained significant popularity among university students.

2.3.2 Intelligent Supervision: Simulating Enterprise-Level Mobile Office

Self-improvement is inseparable from process supervision and management. In the "era of mega science", intelligent mobile office platforms such as "DingTalk" provide features like daily check-ins, customized logs, and video conferences. Additionally, various WeChat mini-programs address process supervision concerns, making learning and management more effective.

2.3.3 Fostering Innovation Through "Short Videos and Competitions"

Innovation is an indispensable skill for contemporary university students [7]. It involves a series of processes such as observation, discovery, practical application, and reflection, all of which contribute to nurturing students' innovative thinking. Additionally, creating short videos, participating in innovation and entrepreneurship competitions, "Internet+" competitions, provincial competitions, national competitions, and other contests stimulate learning through competition while also cultivating students' professional skills. Moreover, these activities play a significant role in fostering students' innovation capabilities [8].

3. Current State of Undergraduate Tutorial System

In recent years, the undergraduate tutorial system has gained popularity in major universities [9,10]. Its primary objectives can be summarized as follows: ① Assisting freshmen in quickly understanding their chosen disciplines; ② Providing guidance on learning and exam strategies; ③ Enhancing

personal development and capabilities; ④ Offering recommendations and guidance for internships and employment opportunities.

However, the undergraduate tutorial system lacks standardized management protocols for reference. This paper aims to explore the management aspects of the tutorial system based on the author's experience in their university over the past five years. It presents suggestions and recommendations for the operational management of the undergraduate tutorial system.

4. Operational Practices of the Undergraduate Tutorial System

4.1 Overall Management Framework

The practical mechanism of putting "student growth at the center" is of paramount importance [11,12]. In the author's university, emphasis is placed on the core principles of "service" and "exploration", leveraging the opportunities presented by the "era of mega science". Through the implementation of strategies such as the "Four-One Project updates", "daily activity records", and "periodic work briefings", students are provided with comprehensive support. The approach prioritizes tasks over traditional teaching methods, focusing on capacity building and encouraging students' critical thinking. By harnessing the potential of the "era of mega science", technology empowers higher education, ensuring the supervision of the entire tutorial process and exemplifying the role of technology in serving universities. The commitment lies in effectively utilizing technology to establish a robust tutorial system.

The "Four-One Project updates" typically consist of the following activities: spending one minute at xuexi.cn, conducting one search on "Baidu" each day, reading one book, and acquiring one new skill.

"Daily activity records" are authentic records of activities, which are generated based on prior activity plans. In the "era of mega science", daily activities are not limited to traditional offline events. The recording process itself can also utilize convenient tools such as Evernote or sticky notes.

"Periodic work briefings" represent the achievements accomplished during specific stages. By utilizing methods such as "research" and "visualization", students are

able to enhance their abilities in questionnaire design, graphic design, aesthetic understanding, and the study of arts. Specific implementation methods can include using software like WPS and PhotoShop.

4.2 Daily Management System

The daily management system refers to the constraints put in place to establish a tutorial paradigm from an operational perspective.

This paper primarily explores the selection and mobilization of tutorial personnel, the frequency and timing of activities, and the content of these activities. Through a survey conducted on 229 students from various grades and tutorial groups, the following conclusions were drawn.

4.2.1 Personnel Selection and Mobilization

The survey question "Do you think it is reasonable to implement the tutorial program starting from the first semester of the freshman year?" revealed the results as illustrated in Figure 1:
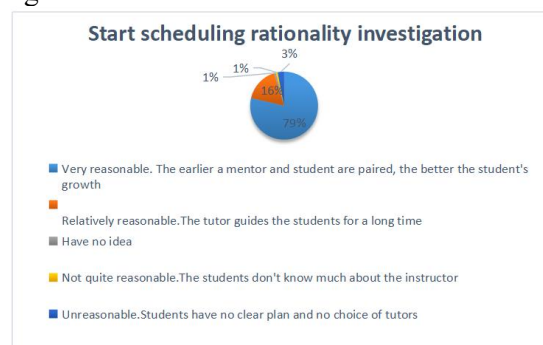

Figure 1. Investigation on the Start Time of Tutorial System

Results analysis: The majority of students are able to accept the implementation of the tutorial program starting from the first year, and the main reasons are as follows: a. Through the tutorial program, students can quickly gain a comprehensive understanding of their major. b. Tutor guidance provides a longer duration of support, allowing for more tailored and personalized student development. A very small portion of students expressed opposition, citing the following reasons: a. Students lack sufficient knowledge about tutors, making it difficult for them to subjectively choose their tutors. b. Freshmen students are in a state of uncertainty and may not have a clear career aspiration yet.

Suggestions and Approach: Overall, the implementation of the tutorial program from

the freshman year brings more benefits than drawbacks. In response to the aforementioned issues, our university has adopted the following practices: a. Standardizing tutor profiles and activities: In the initial stage of the tutorial program, tutor profiles and enrollment requirements are formulated. Tutors then tailor activity plans based on individual student characteristics. For effective implementation, established teaching methods such as Problem-Based Learning (PBL) can be referenced. This approach places students at the center and develops case studies personalized to their needs. b. Conducting personnel mobilization during the first two weeks of each semester: This enables both tutors and students to connect with like-minded individuals, fostering a positive feedback loop.

4.2.2 Activity Frequency and Duration

Duration: The survey results for the questions "How long does each communication with your tutor typically last?" and "How long would you prefer each communication with your tutor to last?" are displayed in Figure 2.
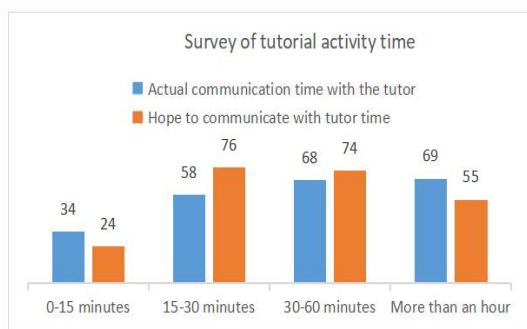

Figure 2. Investigation on the Communication Time between Students and Tutors

Results analysis: Based on the analysis of the results, both the actual and preferred durations for each communication generally fall within the range of 15-60 minutes. Communications lasting over one hour are considered as one hour. The average duration of actual communication with tutors is approximately 38.25 minutes, while the average preferred duration is around 37.21 minutes.

Suggestions and Approach: Overall, it is advisable to avoid excessively long communication time, as students may perceive them as burdensome. Conversely, sessions that are too short may leave students feeling that there is inadequate content or insufficient

engagement. Therefore, it is recommended to keep each communication session within the range of 30-45 minutes, with flexibility to adjust based on the specific activity and individual student needs.

Frequency: The survey results for the questions "How often do you have communications with your tutor?" and "How often would you like to have communications with your tutor?" are depicted in Figure 3.
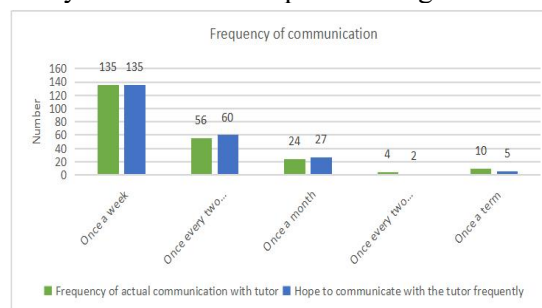

Figure 3. Investigation on the Frequency of Communication between Students and Tutors

Results analysis: The results indicate that 58.95% of students have both their actual and preferred frequency of communications with their tutors set as once a week. Furthermore, 24.45% of students have an actual frequency of communication of once every two weeks, while 26.20% prefer the same frequency.

Suggestions and Approach: It is recommended that tutors aim to have communications with their students at least once a week, provided that the circumstances allow for it.

4.2.3 Activity Content

The survey results for the question "What guidance do you expect from your tutor? (Please select the top three most important items)" are depicted in Figure 4.

Results analysis: The top five items that students desire the most from their tutors, as depicted in Figure 4, are learning method instruction, course learning assistance, examination guidance (such as postgraduate entrance examination), personal ability development, and extracurricular science and technology activities.

Suggestions and Approach: When forming tutorial groups, it would be beneficial to group students based on their specific areas of interest or concern. By doing so, the tutorial groups can have a more cohesive target audience, which would facilitate more effective group activities.
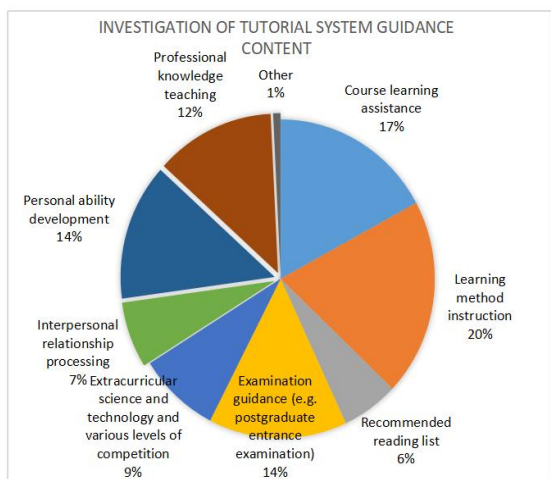
Figure 4. Investigation on the Guidance Content of Tutorial System

5. Discussions and Conclusion

The purpose of the tutorial system is to educate and cultivate students. As the student population evolves with the changing times, their thoughts, emotions, and various aspects undergo transformations. Therefore, the tutorial system should "be centered around the students", taking into account their individual needs and aspirations. In-depth research should be conducted on various aspects, such as learning and career planning, as well as regular communication. By utilizing modern technological tools for process management and establishing comprehensive management systems, from overall frameworks to daily operations, a paradigm can be formed to facilitate the holistic development of students.

The tutorial system is a comprehensive undertaking that cannot be achieved overnight. It involves students, parents, tutors, and educational institutions, requiring coordination and collaboration from all parties involved. Parents play a role in assisting tutors in understanding the students, while educational institutions provide support in terms of institutional framework and funding for the tutorial system. Each educational institution also needs to tailor their tutorial system to the specific needs and circumstances of their student body, in order to maximize its effectiveness and efficiency.

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