Historical Development of the Undergraduate Educational Model at BIT from the Perspective of *Suzhi* Education

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Abstract.   From the perspective of *suzhi* education, this study analyses the historical development of the undergraduate educational model at Beijing Institute of Technology (BIT).   It could be argued that BIT's talent-cultivating system's transformations from 1940 to 2020 echo Chinese higher education's reform and development.   This study concludes that BIT has experienced four phases: (1) from advocacy for general-specialized education's integration to general education's disappearance, (2) from the rectification of specialized education to the germination of *suzhi* and general education, (3) the flourishing of *suzhi* education and general education, and (4) the establishment of the *Shuyuan* System.   The case of BIT reflects Chinese higher education's development and the process of transforming from meritocracy to popularization.   Chinese universities have changed their paradigm from emphasizing specialized education to highlighting *suzhi* education, as well as from focusing on training students into specialists to stressing students' holistic development.

Keywords: Beijing Institute of Technology (BIT), general education, *Shuyuan* system, *suzhi* education, undergraduate educational model

Introduction

Since the 1980-1990 period, *suzhi* education, among the most recognized educational discourses with Chinese characteristics, has been introduced to Chinese educational fundamental policies and educational reform development (Qu, 2017).   *Suzhi* in the context of China refers to the long internalized and relatively stable traits of a holistic person shaped by nature, their upbringing, school education, and their social environment.   Thus, the ultimate goal of *suzhi* education is to improve one's *suzhi* as a holistic person.   *Suzhi* education emphasizes developing students' morality,

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intelligence, physique, and aesthetics by continuous nurturing and accumulating their personality, knowledge, innovation spirit, and practical abilities, and finally promoting students' well-rounded development (Pang, Shen & Hou, 2018).   The meaning of *suzhi* education is intertwined with its counterpart concepts such as general education, liberal arts education, or リベラルアーツ (*Kyouyou*) education in different contexts.   Regarding educational goals, liberal education and general education which are rooted in western society are consistent with Chinse *suzhi* education in their concern for "whole person" education and individuals' all-round development.   Liberal education, which originated in ancient Greece as an aristocratic privilege, emphasized mind illumination, self-cultivation, and anti-utilitarian vocational training.   General education, developed in the 20th century US, was endowed with the essence of citizenship education for a democratic society.   In colleges, general education was practiced through general education courses.   Comparatively, Chinese *suzhi* education, which aims to serve all students, stresses their comprehensive quality and all-round harmonious development without excluding vocational training.   *Suzhi* education penetrates throughout the whole education process such as formal general courses, extracurricular courses, and the residential college system (Pang, Cheng, Yu & Wu, 2020).   In the Asian cultural background, the Japanese リベラルアーツ (*Kyouyou*) education is more similar to Chinese *suzhi* education. Accordingly, this study defines *suzhi* education and general education as mutually explainable.

The predecessor of Beijing Institute of Technology (BIT) is the Academy of Natural Sciences, which was founded in 1940 in Yan'an and was relocated to Beijing in 1949.   According to the official website, BIT now has developed into a comprehensive and first-class research university, including 18 professional schools, 9 colleges, 3,420 staff and 28,460 students.   This paper analyzes the historical changes of undergraduate education at BIT during the period 1940-2020 from the perspective of general education, from which we can see the reform and development track of China's higher education.

1940–1978: From advocacy for general-specialized education's integration to general education's disappearance

Around 1940, the Communist Party of China founded the Academy of Natural Sciences in Yan 'An with the mission of "training technical cadres and specialized technical personnel for the armed resistance as well as the founding of the new country" (The historical materials of Yan 'an academy of natural sciences, 1986, p.1-2).   The academy emphasized the educational strategy of combining theory with practice and put forward the goal of integrating general education with specialized education.   At the first opening ceremony on September 1, 1940, the president Li Fuchun pointed out that the mission of Academy of Natural Sciences was to "cultivate professionals who are knowledgeable about revolutionary theories and natural sciences and are consistent in theory and practice" (Tan, 2004, pp.11-21).   As a consequence, students were required to "be both technical

specialists and revolutionary generalists" (Tan, 2004, p.11-21).   The second president, Xu Teli, who was a famous educator and the teacher of Chairman Mao Zedong, also advocated the integration of general education and specialized education and opposed premature specialization.   He claimed:

Without the fundamental scientific knowledge and only depending on specialized skills, one cannot grow up into a holistically developed person.   Instead of creating knowledge, the premature specialization can only maintain what has already existed.   Specialists grow up from generalists, and the latter should master specialized knowledge (Tan, 2004, pp.11-21).

Due to the special context of wartime, the general-specialized education's integration advocated during 1940 to 1952 actually focused on cultivating students with political thoughts and specialized skills, which was embodied in the emphasis on ideological and political education and fundamental natural science education.   The 3-year undergraduate system of the Academy of Natural Sciences set up departments of physics, chemistry, biology, geology and mineralogy, mechanical engineering, and chemical engineering.   The instruction highlighted integrating theory with practice and social production.   For instance, students collected plants for making specimens in their botany class. They also learned to develop new varieties of crops on the farm.   The academy even built a machinery factory and chemical factory for students' field work, in which teachers and students explored specialized knowledge while producing emergency supplies such as surgical instruments and soaps.   In addition, all students were required to take political theory courses which accounted for about 20% of the total credits.   At that time, the severe conditions did not hinder the enthusiasm of the 260 young students who had built rapport with their cohort, for they often held art performances and sports games.   Unfortunately, such educational practice did not form a sustainable model due to the war and the school's relocation.

After the founding of the People's Republic of China in 1949, the devastated country was to be rebuilt by large numbers of professionals.   Therefore, imitating the former Soviet Union's educational system, Chinese higher education started to adjust or remold universities in terms of departments, majors, and teaching plans.   While such adjustments built up the specialization-oriented educational model, general education vanished from the scene.

Following the higher education system of the former Soviet Union, the extensive adjustment during 1952-1957 divided higher educational institutes into general universities, which contained liberal arts departments and science departments, and professional schools, which consisted of various departments based on disciplines.   The rationale of the reform was that by assembling similar disciplines or majors from different universities into certain ones, the disciplinary advantages would be finally established (Hao & Long, 2000).   Under this transformation, however, the comprehensive universities with complete disciplines disappeared and about 93% of them became specialized institutes or engineering institutes.   Hence, the possibility of inter-discipline or disciplinary crossing was weakened, which eliminated general education's implementation.

At the time, BIT was oriented towards national defense industry. Therefore, institutes such as its mining department, metallurgy department, aviation department, and non-ferrous metal majors were transferred to Central South University and Beihang University, and weapons industry majors were merged with other colleges. Constructed as an engineering-industry-focused college with impaired disciplines of natural science, BIT's educational system followed the former Soviet Union in terms of its educational ideology, major setting, curriculum content, and instructional methods.

Firstly, majors at BIT were set to cater to the needs of products, which narrowed students' professional choices. Before the educational reform in 1952, the college organized teaching and learning by disciplines, and various majors were available. The new major system afterwards, however, aimed to cultivate professionals with specialized skills for the requirements of industrial production.

Secondly, teachers who taught similar courses were gathered to form a collaborative group for specialized teaching and research. The group, called teaching and researching office or *Jiaoyan Shi*, thereby became the basic teaching unit of each department. *Jiaoyan Shi* effectively improved the management of teachers and instructional practices, which strengthened the quality of teaching. Such an organizational form operated until 1990s before being replaced by research teams.

Finally, the curriculum was strictly planned and highly centralized at the college level. Specifically, imitating the curriculum construction of the Soviet Union, BIT developed a three-layer curriculum structure that included fundamental courses, professional and specialty fundamental courses, and major courses. The curriculum addressed specialized education such that students could master specialized knowledge for their future work. Accordingly, natural science courses such as physics, chemistry and other major courses took 80% of the credit hours, leaving 20% for humanities and social sciences courses like politics, Russian language, and sports. The teaching process with an emphasis on practicing and engineering training also highlighted teaching-centered, teacher-dominated, and class-focused characteristics (Tan, 2004). The centralization in the educational system, in terms of major setting, teaching plans, syllabus, textbooks, teaching process, and educational administration, stereotyped higher educational institutes and harmed students' personality development.

In general, the most noticeable feature of Chinese higher education during the 1952-1978 period was the authorization of specialized education by the central government. Consequently, the concept of *specialization* in Chinese universities to some extent overlaps the meaning of *major*, for they both refer to different disciplines, professional domains for student's development, and interest entities which consisted of students, teachers, founding, laboratories, and instruments (Lu, 2002). Generally speaking, while specialized education accelerates China's industrialization by training a large number of talents with specialized skills and professional knowledge, it simplifies academic disciplines, narrows down student's vision, and stifles innovation. Thus, a reform is imperative.

1978–1995: From the rectification of specialized education to the germination of *Suzhi* education and general education

After China's Opening-up Policy in 1978, Chinese higher education started to rectify specialized education by adjusting disciplinary structure and divisions, amending major catalogues, broadening professional options, and reforming curriculum and instruction.

Within that larger picture, BIT attempted to rebuild its specialized educational model with profession adjustment.   The administrators agreed that professions at BIT must be adjusted to change the situation that engineering majors dominated the system, for the goal of building a comprehensive university by integrating science, engineering, management, and humanities while retaining an emphasis on engineering majors.   Furthermore, instead of being oriented to social products, the major setting and management system would be transformed based on disciplines and departments (Tan, 2004).   Therefore, BIT operated three substantial adjustments on major setting in 1985, 1990, and 2002.   The subsequent movements included merging majors with similar disciplinary foundations, expanding options of majors on military products, adding foundational majors on natural science such as applied mathematics and applied physics, setting up more humanities and social sciences majors like industrial design, English language, law, international economics and trade, marketing, and accounting, and opening up emerging interdisciplinary and general majors in terms of bioengineering, environmental engineering, information engineering, information countermeasure technology, and detection guidance and control engineering (Construction and evaluation of curriculum group, 1999).

During this period of disciplinary and major adjustment, two dramatic changes at BIT could be summarized.   First, disciplinary categories were significantly broadened, which built a disciplinary foundation for general education.   BIT had evolved from an engineering institute with 8 departments and 30 majors in 1979, to a comprehensive university which consisted of 11 schools, 35 departments, and 51 undergraduate majors in 2003.   In 2019, BIT had 18 schools, among which six were related to humanities and social sciences (Table 1).   BIT had greatly strengthened majors of humanities and social sciences, as well as foundational majors of natural science such as mathematics, physics, bioscience, and materials.   Such changes improved the campus' cultural atmosphere and provided the potential disciplinary basis and teacher resource for practicing general education.   Furthermore, it effectively supported the construction of some applied and traditional majors like aerospace, electronic information, and chemical materials.

The second change was that the objectives of talent cultivation and the curriculum system were transformed from specialized education to general education.   In 1979, 1986, and 1992, BIT successively amended its curricula three times, among which the one of 1979 rescheduled the curriculum to the specialized educational instruction in 1950.   The objective of the 1979's curriculum was to foster "senior engineering technical professionals for national defense.   These talents should be with moral, knowledge, and physical fitness for national defense, and have constant loyalty to the

country" (Teaching plan: Four-year system, 1979, p.51).

Table 1. Change of schools and majors of BIT (Year 1979–2019)

1979	2003		2019
1. Flight Vehicle Engineering Department	**1. School of Mechatronical Engineering**	Department of Flight Vehicle Engineering	**1. School of Aerospace Engineering**
2. Department of Mechanics Engineering		Department of Mechanics Engineering	**2. School of Mechatronical Engineering**
		Department of Mechatronical Engineering	
3. Department of Automation	**2.School of Information Science and Technology**	Department of Automation	**3. School of Automation**
4. Department of Engineering Optics		Department of Photoelectric Engineering	**4. School of Optics and Photonics**
5. Department of electronic engineering		Department of electronic engineering	**5. School of Information and Electronics**
6. Department of Vehicle Engineering	**3. School of Mechanical Engineering**	Department of Vehicle Engineering	**6. School of Mechanical Engineering**
7. Department of Mechanical Engineering		Department of Thermal Energy and Power Engineering	
		Department of Mechanical Manufacturing and Automation	
		Department of Traffic Engineering	
8. Department of Chemical Engineering	**4. School of Materials Science and Engineering**	Department of Materials Physics and Chemistry	**7. School of Materials Science and Engineering**
		Department of Materials Science	
		Department of Material Processing and Control Engineering	
	5. School of Chemical Industry and Environment	Department of Chemical Engineering	**8. School of Chemistry and Chemical Engineering**
		Department of Applied Chemistry	
		Department of Environment and Energy	
	6. School of Life Science and Technology	Department of Biological Science	**9. School of Life Science**
		Department of Biomedical Engineering	
	7. School of Computer Software	Department of Computer Science Engineering	**10. School of Computer Science and Technology**
		Department of Software Engineering	
	8.School of Science	Department of Mathematics	**11. School of Mathematics and Statistics**
		Department of Physics	**12. School of Physics**
		Department of Chemistry	**Merge into School no. 8**
		Department of Mechanics	**Merge into School no. 1**
	9. School of Management and Economics	Department of Management and Scientific Engineering	**13. School of Management and Economics**
		Department of Business Administration	
		Department of Practical Economics	
		Department of Public Administration	**14. School of Humanities and Social Sciences**
	10. School of Humanities and Social Sciences	Department of Humanities and Social Sciences	**15. School of Marxism**
		Graduate School of Education	
		Department of Law	**16. School of Law**
		Department of Foreign Languages	**17. School of Foreign Languages**
	11. School of Design and Arts	Department of Industrial Design	**18. School of Design & Arts**
		Department of visual communication	
		Department of environmental art	

In 1986, BIT proposed new educational objectives for undergraduate students that they are to become senior engineering technical professionals, scientific professionals, or management engineering professionals who have a holistic development, broad vision, strong adaptability, solid foundation, and creativity.   Thus, curriculum setting was reoriented towards general education from specialized education, which highlighted reasonable and balanced relationships between natural science and social science, foundational knowledge and specialized knowledge, and the existing course content and the content to be renewed.   Additionally, the curriculum emphasized discipline crossing and widening students' horizon of knowledge (Strengthening the pilot work plan of university students' cultural Suzhi education, 1986).   By following these objectives and stressing teaching foundational knowledge, foundational theories, and basic skills, BIT firstly strengthened the teaching practices of foundational courses and expanded professional options.   Secondly, BIT improved humanities and social sciences education by increasing its credit hours to 22.75% of the total. Specifically, there were six new elective courses available for all students in 1986, including Foundation of Management Science, History of Science and Technology, Logistics, Introduction to Literature, Introduction to Aesthetics, and Economics.   It was these courses that introduced the subsequent elective courses for general education.   Finally, BIT provided more freedom for students' learning by partly implementing a credit system, cutting down required courses, and increasing elective courses.   By taking these measures, the amount of major elective courses and humanities and social sciences elective courses accounted for about 20% of the total 2,400 class hours and 310 credits, which changed the prior dominance of required courses in the curriculum.   The curriculum adjustment in 1992 followed the logic of 1986 that the curriculum should be transformed from specialized education to general education.

In the 1990s, the Chinese government launched a new round of university adjustment and mergers.   From 1990 to 2001, 1086 universities were merged and consolidated into 431 (MOE, 2006). From then on, there emerged a group of comprehensive universities in China with a complete range of disciplines such as humanities, science, engineering, agronomy, and medicine.   Paving the way for general education, the adjustment and merger reforms not only rectified the extensive reforms to universities of 1952, but also promoted discipline crossing and integration in universities.

In general, after about forty years of tortuous development, Chinese higher education finally stepped into a progressive track with its gross enrollment rate increasing from 0.26% in 1949 to 2.08% in 1979, and to 7.2% in 1995 (Yi, 2016).   During the 1978–1995 period, while the conceptions of *suzhi* education and general education had not been explicitly defined, they started to germinate in the soil of educational reform.   Along with the development of China's economy and productivity, while abiding the theory of serving society as the standard for education, Chinese education started to attach increasing attention to people's overall quality.   For instances, two government documents, *The Decision of the Reform of Education System* issued by the Central Committee of the Communist Party of China (CCCPC) in 1985, and *The Outline of Chinese Educational Reform and Development* jointly

issued by the CCCPC and the State Council in 1993, both clarified that social development increasingly depended on labor's quality, so the primary aim of education reform was to improve people's quality.   *Suzhi* education was recognized to be an inevitable choice for Chinese educational reform and development in the new era (Li, 2003).

1995–2018: The flourishing of *Suzhi* education and general education

Since the mid-1920s, *suzhi* education, which was targeted at the 21st century's teaching content and curriculum system reform, has been carried out due to the Ministry of Education's efforts.   On July 1995, the Ministry of Education (MOE) issued *The Notice on the Pilot Work of Cultural Suzhi Education for College Students* and identified 52 universities such as Peking University, Tsinghua University, and BIT as pilot universities for enhancing students' cultural education.   In 1998, the Ministry of Education issued *The Suggestions of Strengthening Cultural Suzhi Education for College Students* and further clarified the significance and urgency of strengthening cultural education in terms of teaching approaches and methods, and teacher preparation.   In 1999, several pioneering model institutes of cultural education were established among universities in China.   In the same year, *The Decision of Deepening the Reform of Education and Promoting Suzhi Education* issued by the CCCPC and the State Council pushed cultural education to a new zenith.   In 2010, another document *The Outline of National Medium and Long-term Educational Reform and Development* defined that *suzhi* education was the strategic theme for China's educational reform and development (Li, 2003). Meanwhile, based on the spread of *suzhi* education, the concepts of liberal education and general education, originating from the western context, were rapidly acknowledged by Chinese universities, together influencing Chinese universities' educational reform alongside *suzhi* education.

Zhou Yuanqing, the former Vice Minister of the MOE, indicated that cultural education was not only for the purpose of improving university students' cultural quality, but also to explore educational reform regarding the talent-cultivation system, educational thoughts and ideas, and educational content. In other words, cultural education was a profound exploration of educational and instructional reform toward the 21st century (Zhou & Yan, 2004).   BIT echoed these tenets and argued that, through *suzhi* education's assumption as the pervading logic of higher education, the teaching content and curriculum system had exceeded the specialized education system built by the former Soviet Union, transforming the talent-cultivation system with an orientation to general education.

As one of the first pilot universities for cultural education, BIT formulated *The Plan on the Pilot Work of Strengthening Cultural Suzhi Education for College Students* on March 1996, putting forward basic objectives, operative approaches, and supporting measures (Strengthening the pilot work plan of university students' cultural Suzhi education, 1996). On November 1996, BIT further made *The Suggestion of Deepening the Reform of Teaching Content and Curriculum System in the 21st Century*, stating that:

> [Education] should abandon the idea of narrowing major division and knowledge segmentation for the more comprehensive and integrative *suzhi* education, the idea of simply teaching knowledge for the creativity spirit that underlined employing enlightening thinking and analysis skills for problem solving, and the idea of indoctrination in education that teacher lectured and students listened for the strategy of arousing students' initiative and enthusiasm. In one word, educational paradigm should transform from stressing students' general characteristics for following their personality development (Construction and evaluation of curriculum group, 1999, pp.66–71).

Based on the ideas of strengthening foundational knowledge, diluting the concept of specialized education, enhancing practices, and improving quality, BIT significantly amended the undergraduate syllabus. Specifically, undergraduate students were required to earn 180 credits on courses including public fundamental courses, disciplinary fundamental courses, major courses, field experiences, and graduate projects. The ratio of credits of required courses and elective courses was 7:3.

In 2003, BIT firstly introduced the concept of general education into the graduate curriculum and implemented *Regulations on Elective Course of General Education for Undergraduate Students*. The document underlined that general elective courses were the aspect of the curriculum that respected educational individualization and improved students' knowledge and intelligence. General elective courses played a crucial role for students to broaden their intellectual insight, foster their ability, and improve their quality. Therefore, undergraduate students were required to take 6 to 8 credits in general elective courses from six categories which were History & Society, Economics & Law, Literature & Art, Language, Natural Sciences, and Engineering Technology. Viewing such a movement with today's perspective, one could say that the significance of adding general elective courses went beyond just opening up elective courses. On one hand, aiming to enhance cultural education, general elective courses not only provided students with study materials beyond professional learning, but also accelerated the reforms in teaching content and the curriculum system, influencing the transformation of the previous talent-cultivation model that overemphasized specialization. On the other hand, general elective courses gradually promoted the establishment of the elective system and credit system, which further usurped the centralized educational model. On September 2003, BIT formulated the *Suggestion on Deepening Credit System and Elastic School System* and constructed a conducive administrational environment for *suzhi* education. The educational administrational system manifested the idea of human oriented education and boosted students' learning independence, selectivity, and flexibility.

Specifically, the disciplinary foundational course employed a teaching plan based around specialized categories, meaning that all undergraduate majors were divided into seven main categories in accordance with their disciplinary characteristics: Military Mechanical Engineering, Information, Chemical Engineering, Sciences, Management, Humanities, and Art. For the first three semesters, two groups of undergraduate students, one in Science and Engineering, and the other in Humanities,

Management, and Art, were required to register two categories of foundational courses.   For the first five semesters, undergraduate students should complete their major learning.   The development of disciplinary foundational courses reformed specialized education and activated professional learning, which promoted the overall implementation of the elective system and credit system and facilitated students' transfer of their majors.   It also set a stage for the reform of general education.

In 2009, BIT held the university's 13th Conference of the Communist Party and concluded the experience of talent-cultivation practices.   At the conference, the overarching educational objectives that students should have were presented as "noble ideal[s], profound academic ability, strong body, and beautiful mind" (Course structure of the undergraduate programs of Beijing Institute of Technology, 2016, pp.6-7), and it was suggested that the curriculum should focus on fostering students' innovation and application ability by "solidifying foundational theories, broadening professional knowledge, activating academic thoughts, and practicing creative ideas" (Course structure of the undergraduate programs of Beijing Institute of Technology, 2016, p.34).   These objectives made great contributions to cultivating students into versatile, high-quality, innovative talents.

Along with the progress of BIT's reforms to the undergraduate educational system and strengthening of general education and *suzhi* education, a new model was carried out in which freshmen and sophomores majoring in similar majors could take the same courses.   The model encouraged students to choose their preferred specialties and transfer to different majors with autonomy.   In 2016, by highlighting student-centered educational ideas and outcome-based education, BIT overhauled the undergraduate talent-cultivation system (Table 2) and further enhanced *suzhi* education and general education.

According to the reformed model, the *suzhi* education system included the first class (the formal class) and the second class (the informal class).   The first class referred to the normal courses in general education such as "The Common Basic Courses of Social Sciences" and "The Common Basic Courses of Natural Sciences," as illustrated in Table 2.   These courses aimed to educate students with moral cultivation, cultural scientific literacy, broad vision, and a strong body.   The second class included extracurricular activities including undergraduate students' scientific and technological innovation competitions, general lectures, cultural & art performances, sport activities, students' club activities, volunteer services, and social practices.   Through these various activities, students' vision was broadened and their acquired knowledge was transformed to core competences and internalized qualities.   Additionally, the student associations organized the Annual Extracurricular Summing-up Session, in which students shared and communicated their achievements on political thoughts, moral reflection, physical and psychological health, and career planning.

In conclusion, Chinese universities' *suzhi* education and general education flourished during period of 1995–2018.   Chinese higher education also entered a time of rapid development after an extended period of steady improvement.   For example, while the higher education gross enrollment rate of 1995 was 6.85%, by 2002 this reached 15%, due to the large-scale enrollment expansion in

1999.   As of 2018, the gross enrollment rate of 2018 had risen to 48.1%, before exceeding 50% in the 2019–2020 academic year, indicating that Chinese higher education massification entered a new phase (Zhong & Wang, 2019).   Correspondingly, the number of enrolled students in BIT increased (Figure 1).

Table 2. Undergraduate education content system of Beijing Institute of Technology
(Taking one engineering major of BIT as an example, usually 170 credits are required for a 4-year undergraduate.)

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1. The common basic courses of social science Total 36-38 credits	Required courses 26 credits	Ideology and Political Theory Courses 14 credits, including: Morals, Ethics and Law, Outline of Modern Chinese History, Basic Theory of Marxism, General Introduction to Mao Zedong Thought and Socialist Theory with Chinese Characteristics, Psychology Education, I-VIII Situation and Policy I-VIII English for General Academic Purposes 8 credits; Physical Education 2 credits; Military Theory and Military Training 2 credits
	General education elective courses 6-8 credits	Including six categories: A. Philosophy and History; B. Literature and Arts; C. Health and Society; D. Economy and Politics; E. Science and Technology, F. Innovation and Entrepreneurship; More than 200 courses are provided per year with 32 class-hour and 2 credits per course. Students are required to select 6-8 credits from different categories.
	General Education on Practice Training 4 credits	Including three categories: Artistic Practice, Scientific Practice, Cultural Practice
2. The common basic courses of natural science	35 credits	Higher Mathematics, College Physics, College Chemistry, Computer Science
3. The professional courses	65 credits	To learn basic courses in general discipline and professional core courses
4. Practice Training	32 credits	Including Experimental Courses, Professional Internship, Engineering Practice, Graduation Project (Thesis), etc.
Second Class—Unofficial courses	Suzhi Education	Moral Education Defense, Extracurricular Lecture, Reading Activity, Arts and Sports, Students Social Group, etc.
	Social Practice	Science and Technology Innovation Competition for College Students, Volunteer Services, Social Practices, etc.
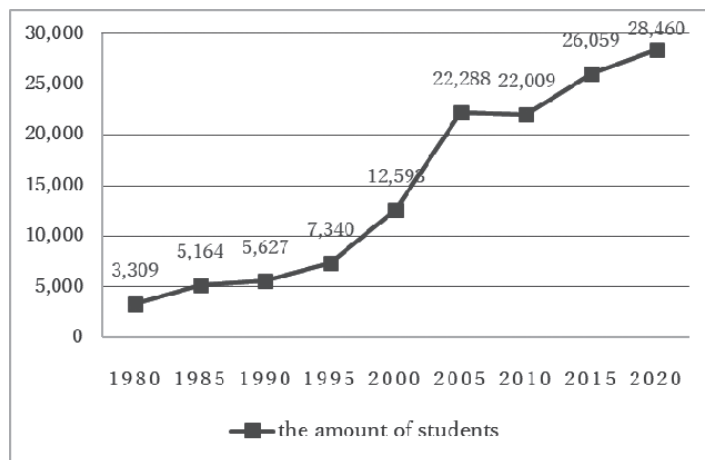
Figure 1. The amount of students at BIT during 1980-2020

It was the popularization of Chinese higher education that revealed the significance of fostering university students with core qualities and basic abilities.   Increasingly noticed by the public, *suzhi* education and general education triggered serious reforms in the university curriculum system and talent-cultivation model.   To meet the needs of a diverse student body and their personalized learning in an era of mass higher education, BIT's cultivation scheme of 2016 spotlighted the characteristics of modularity, diversity, and elasticity.   The curriculum system consisted of three modules, divided between foundation courses, specialization courses, and practice training courses.   Majors of different disciplines could be set by combining any modules with flexibility and the same course could be carried out by multi-level teaching to meet certain requirements.   The scheme provided students space for their self-directed study, flexible learning options, and personal development (Course structure of the undergraduate programs of Beijing Institute of Technology, 2016).   Through more than twenty years' practice of *suzhi* education, the specialized cultivation model developed in the 1950s was fundamentally improved.   Under the direction of *suzhi* education, the undergraduate educational model that integrated general education and specialized education was formed.

2018–the present: Setting the stage for the modern *Shuyuan* system

The popularization of Chinese higher education drew the Chinese government and the Ministry of Education's attention to talent cultivation and undergraduate education.   Around 2018, they convened the *National Conference on Undergraduate Education of Higher Institutions in the New Era* and the *National Education Conference*, and the MOE issued *The Suggestion of Deepening the Reform of Education, comprehensively Improving the Quality of Talents Cultivation.*   The core idea of these movements was that universities should enhance and prioritize moral education, put students at the center of education and promote their all-round development, form a higher level system of talent-cultivation, and build China into a powerful country of higher education (MOE, 2018).

It was against this background that BIT once more reformed its educational system in 2018.   By integrating general education, categorized major foundations, specialties, and optional majors, the reform constructed a talent-cultivation model with multiple forms, approaches, and objectives.   This model strengthens *suzhi* education and general education, setting the stage for the new *Shuyuan* System.

Shuyuan 书院, literally meaning the place of teaching in Chinese language, is an administrative unit to manage students' lives and studies.   Traditionally, students would form classes based on their majors.   *Shuyuan*, however, gathers students by their residential places.   In other words, students living in nearby dormitories will develop a *Shuyuan*.   It is different from the ancient Chinese academy system and more like the western residential college system.   Three specific measures were employed to build modern *Shuyuan*.

Firstly, BIT further implemented the strategy of enrolling and cultivating students in broader

categories, and extended students' options on courses and majors. Under the specialized education model which had prevailed for many years, Chinese universities tended to recruit students by specialties. Therefore, students had to choose their majors when taking the *Gaokao* (Chinese college entrance examination) and were administered by specialized departments after being admitted to university. This model narrowed students' knowledge and restricted their ability to transfer majors. To eliminate these issues, BIT merged 67 undergraduate majors into 34 categories in 2013 and then 19 specialized categories in 2016. In 2018, BIT further set 10 major admission categories and recruited students by crossing schools and disciplines. After admission, students were administrated by *Shuyuan* and received a one-year general education. Thereafter, they could choose their preferred major and start to learn specialized courses. In providing students with more independence in choosing their major, BIT's adjustment strengthened general education.

Secondly, BIT launched a reform on employing the modern *Shuyuan* System to administrate students. As with the admission system, the *Shuyuan* System was a reform to the university's administrative model. Instead of studying in professional schools, students in their first year would not choose majors but were registered in *Shuyuan*. In 2018, BIT established 9 *Shuyuans* which covered various major categories and professional schools (Table 3).

Table 3. The *Shuyuan* system of Beijing Institute of Technology

Name of Shuyuan	Admission Major Category	Covered Professional School
1. Jinggong Shuyuan	Aerospace and Mechatronics, Intelligent Manufacturing and Vehicle (advanced class)	School of Aerospace Engineering, School of Mechatronical Engineering, School of Mechanical Engineering
2. Ruixin Shuyuan	Information Science and Technology, Electronic Information Engineering (advanced class)	School of Optics and Photonics, School of Automation, School of Computer Science and Technology, School of Information and Electronics
3. Qiushi Shuyuan	Science and Materials (elite class)	School of Materials Science and Engineering, School of Life Science, School of Chemistry and Chemical Engineering, School of Physics, School of Mathematics and Statistics
4. Mingde Shuyuan	Social Science Advanced Class (high quality arts class)	School of Humanities and Social Sciences, School of Foreign Languages, School of Law
5. Jingguan Shuyuan	Economics and Management Advanced Class, Accounting (Chinese-international cooperative school)	School of Management and Economics
6. Zhiyi Shuyuan	Design	School of Art and Design
7. Teli Shuyuan	Joint cultivation advanced class through bachelor, master, and doctor. Students can select any majors in the university.	XUTELI School
8. Beijing Shuyuan	Joint cultivation with other universities in Beijing	Beijing School
9. Lingwen Shuyuan	International students	Office of International Students

The essence of the *Shuyuan* System administrative model is that *Shuyuan* becomes a medium to strengthen *suzhi* education and general education. Without choosing majors in their first year, students could receive general education and broaden their visions, with their dormitories emerging as educational playgrounds. The *Shuyuan* were transformed into families and communities where students integrated life and study. The *Shuyuan* System also features an advisor system in which students have academic advisors, general education advisors, and peer advisors, who facilitate students' overall growth. Some students name their colleges as mothers and professional schools as fathers. There is no doubt that the *Shuyuan* System vitalizes students' holistic and harmonious development by accommodating them in family-oriented *Shuyuans*.

Finally, BIT implemented a talent-cultivation program that recruited and cultivated students according to major categories. Amending the *2016 Undergraduate Student's Cultivating Plan*, BIT corrected the issue that students had to take too many courses and had limited independent study time. In addition, BIT reduced credit hours of required courses and stipulated that the maximum number of required credits for four-year undergraduate students to graduate was 140. Among these credits, they were required to attain 65 in general education and 75 in specialized education. Excluding field experience studies, students were not allowed to register for more than seven courses and 22 credits in a semester. Furthermore, teachers were required to design their instruction by employing creative pedagogies and improve their teaching quality, which assisted students to experience deep learning.

To accelerate building general education courses, BIT set up the *Suzhi* Education Center, which was responsible for constructing general education courses, increasing course quantity, and improving course quality. Requiring students to earn at least 8 credits in general education courses, BIT organized courses into 6 modules which were Chinese Culture and Historical Inheritance, Humanistic Sciences and Self-development, Natural Sciences and Modern Technology, Social Sciences and Modern World, Art Appreciation and Aesthetic Experience, and Thinking Literacy and Fundamental Ability. Students were also allowed to take other specialized courses as general education courses. In summary, BIT has taken various measures to promote interdisciplinary and multidisciplinary education such as dual-degree programs, minor studies, and elective courses.

Summary

The year of 2020 was BIT's 80th birthday. Since its establishment in 1940 and the founding of China, BIT and its talent-cultivation system have experienced four phases, from advocacy for general-specialized education's integration to general education's disappearance, from the rectification of specialized education to the germination of *suzhi* education and general education, the subsequent flourishing of *suzhi* education and general education, and finally the establishment of the modern *Shuyuan* System.

Reviewing this history, we can see that as an engineering university founded during the war time,

BIT had been abiding the theory of serving society as the standard for education for a long time. During that time, the main purpose of talent cultivation was to fulfill needs of the country including national defense, the economy, politics, and society progress.   As a result, a specialization-oriented educational model dominated for a long time.   Along with the reform and opening-up of China and the massification and popularization of higher education, BIT implemented three significant reforms during the late 20th century.   The first reform was conducted toward building a more open college, which brought increasingly active ideas and advanced thoughts in operating the university.   In this attempt, BIT initially practiced *suzhi* education and opened up general elective courses.   The second reform was to transform engineering dominated education to a comprehensive one by integrating science, engineering, management, and humanities while maintaining an emphasis on engineering majors.   Such a transformation changed the university's disciplinary structure and cultural atmosphere to a large extent.   The third reform focused on constructing a multi-layered and inter-disciplinary talent training system in which undergraduate, master's, and doctoral students were all included, improving the prior educational model that prioritized undergraduates.   The university began to pay more attention to widening students' scope of knowledge and horizon and promote students' practice and innovation abilities.

Along with the increase of Chinese comprehensive national power and the emphasis on "people-oriented" ideology in the 21st century, the theory of the individual as the standard for education takes a more crucial position.   BIT is increasingly attaching importance to *suzhi* education and highlighting the tenet of student-centered education, which is applied throughout the whole teaching and learning process.   The university has launched a series of reforms including the curriculum, cultivation system, modern residential college system, etc.   These reforms make undergraduate education more comprehensive and all-round in cultivating people, which can be considered as the optimization of undergraduate education quality.

In conclusion, holding the belief that students will realize their holistic potential if their personality development is respected as the ultimate goal of education, BIT will keep stepping forward to *suzhi* education.

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