

Article

Individualized and Innovation-Centered General Education in a Chinese STEM University

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Abstract: The concept and practice of general education have been widely discussed and debated in the Euro-American world, but its adaptation in China needs further discussion and understanding. Over the past decade, its impact on Chinese higher education is increasingly salient, with a large number of Chinese first-tier universities claiming to initiate general education reforms to their previously narrowly focused undergraduate programs. This paper explores the development, implementation, and support of general education in a new type of research university in China from an organizational perspective. Through a case study of the Southern University of Science and Technology (SUSTech) prior to the COVID-19 pandemic, this paper examines SUSTech's individualized and innovation-based general education system, highlighting its institution-wide approach and innovation-centered perspective. The findings underscore the importance of integrating general education principles throughout the university to foster self-directed thinkers and cultivate students' self-awareness, interests, and passions. This study also reveals how general education is used as an organizational solution to address a variety of historical and complicated issues that challenge Chinese universities. This research serves as a catalyst for reform and innovation in Chinese higher education, inspiring transformative practices that meet the evolving needs of students and society.

Keywords: general education; STEM university; whole-institution approach



Citation: Li, X.; Li, Y. Individualized and Innovation-Centered General Education in a Chinese STEM University. *Educ. Sci.* **2023**, *13*, 846. <https://doi.org/10.3390/educsci13080846>

Academic Editors: Edward P. St. John, Luxi Chen, Zachary Taylor, Lijing Yang and Chen Wang

Received: 29 May 2023

Revised: 10 August 2023

Accepted: 17 August 2023

Published: 19 August 2023



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1. Introduction

China, renowned as the world's oldest continuous civilization, has deep philosophical traditions that emphasize character development and the acquisition of knowledge, aligning closely with the holistic principles of general education. Over the past two decades, the number of higher education programs focusing on general education has increased significantly in China. These programs advocate a holistic educational philosophy and provide lifelong learners with a solid foundation of integrated knowledge and social responsibility, challenging the traditional system of specialized training for specific professions.

The roots of general education in China can be traced back to the Republican Era (1911–1949), when Western ideas and practices of liberal arts and general education influenced the country's modern universities. However, these ideas took a backseat in the 1950s when China adopted the Soviet model of specialization [1]. It was not until the 1980s, amidst criticism of the limitations imposed by narrow specialization, that general education regained prominence. Since the 1980s, there have been three proponents of general education in China, each aimed at addressing specific problems [2]. The first was *versatile education* (tongcai education) in the 1980s, which sought to broaden knowledge scope and emphasize knowledge structure. The second was *culture quality education* (wenhua suzhi education) in the 1990s, which focused on humanities and moral education to counterbalance the dominance of hard sciences and engineering. Finally, in the 2000s, *general education* (tongshi education) emerged, emphasizing the intrinsic value of education and combating the sense of self-loss amid a prevailing utilitarian ethos. It has been pointed out

that Chinese educators' commitment to general education in the 21st century has shifted from theoretical debates to practical implementation, with varying degrees of success [2].

An exemplar case of implementing general education exploration in China is the Yuanpei Program at Peking University. Its five-year review (2000–2005) of the program highlighted the recognition of general education as a concept and model for talent development in higher education and emphasized the importance of tailoring the idea of general education to Chinese cultural characteristics [3]. The case study conducted at Peking University examined the significance, feasibility, and systemic challenges involved in implementing general education in comprehensive universities across China. These challenges encompassed institutional environment, conventions, stakeholder conflicts, limited understanding, faculty competence issues, and resource constraints. The study also provided suggestions for foundational modules of general education, encompassing rationales, goals, program arrangements, curriculum design, faculty resources, pedagogy, evaluation, and support systems. Furthermore, the study highlighted the link between general education and liberal education, both aspiring to cultivate well-rounded individuals. This 2008 research report on the Yuanpei Program played a pivotal role in informing and inspiring subsequent education reformers in China, shedding light on critical success factors, obstacles, and difficulties associated with the implementation of general education, particularly when integrated with specialized education within the same university [3].

The two decades before the COVID-19 pandemic have witnessed more prestigious universities in China undertaking educational reforms and pedagogical innovations driven by the aspiration to achieve excellence and leadership in higher education in an increasingly globalized world. Among the forefront scenarios in the reform of Chinese higher education, notable developments include the remarkable expansion of research capacities and the implementation of general education in arts and sciences [4]. These reforms aimed to enhance the quality and global competitiveness of Chinese universities while adapting to the evolving demands of the modern educational landscape.

In addition to internal considerations within universities, scholars have also pointed out that Chinese universities' engagement with general education is motivated by the student recruitment market [5]. The term "general education" gained attention as comprehensive universities sought to establish elite degree programs focused on broader knowledge content and educational objectives. The exploration of general education by top-tier Chinese universities has served as a marketing strategy to attract prospective students, and in turn, has shaped models within the higher education sector. While China has introduced general education with the aim of fostering creativity and innovation and supporting national development goals [6], specific goals and implementation strategies at the institutional and program levels remain unclear [7]. Chinese universities face the challenges of adapting the models of Western universities to their own contexts [8], often drawing on their own practical approaches to general education [7]. In the last decade, newly established research universities in China have embraced the ambition of cultivating innovative and well-rounded talents by using general education as a foundation [7].

This study closely examines the establishment and implementation of general education at a new research university in China that places particular emphasis on fostering students' creativity, innovation, and holistic development. The main objective is to gain insights into the organizational aspects of developing, implementing, and supporting general education programs in alignment with the university's overarching goals. This study also examines how general education has been exploited as an action strategy to address ambiguous systematic problems and thus has gone beyond the scope of discussion in the scholarly field outside of China. By addressing these research questions, this study aims to contribute to the understanding and advancement of general education practices in Chinese higher education and shed light on the broader landscape of educational reform in China.

2. Literature Review

The terms “liberal arts education” or “general education” are widely discussed throughout the world. The earliest writing that attempted to define “general education” can be traced back to the Reports on the Course of Instruction in Yale College in 1828, in which education is believed to provide an individual with a general foundation in areas that are common for all professions, and not just one specialized profession. The Harvard Committee Report in 1945 defines general education as a part of a student’s whole education which looks first of all to his life as a responsible human being and citizen. A review of the current literature in China shows a lack of a coherent and articulated theoretical framework for general education reform [8–10]. This section will discuss the theoretical foundations for this study, which include the functions, approaches, and models of general education, as well as the specific theoretical framework employed in this research.

2.1. Functions of General Education

The surge in general education has been attributed to various factors by scholars, policymakers, and pundits. These factors include the increasing demand for well-rounded workers in the current and future economy, the need to educate individuals who can tackle complex global issues beyond their specific areas of expertise, the imperative for higher education to address ethical, individual, and social responsibilities alongside imparting knowledge and skills, and the importance of granting students the freedom to choose their career paths instead of pressuring them into potentially unsuitable professions at a young age. General education serves multiple functions that include student learning, communal well-being, and institutional purposes. These functions underscore the significance of general education in shaping individuals, society, and educational institutions.

One of the primary functions of general education is to facilitate student learning by promoting a broad range of student learning outcomes. These include developing intellectual proficiencies, fostering ethical and meaningful engagement, and providing a holistic education [11–13]. Through general education, students acquire essential concepts, methodologies, and knowledge in various disciplines [14]. Additionally, general education emphasizes the development of intellectual skills that enable students to make sense of information and their own lives and to apply knowledge for ethical purposes. It aims to produce well-rounded individuals equipped with the intellectual capacities necessary for employment in today’s context [15].

Beyond individual learning, general education also plays a role in fostering communal well-being. It contributes to the formation of an educated citizenry and cultivates a sense of public responsibility [16]. General education is viewed as a means of preparing students who will actively contribute to building a more equitable society and a global community. It strives to achieve democratic outcomes and global learning and aims to create inclusive and just societies. By fostering knowledge, awareness, and actionable consciousness, general education seeks to empower students to become active agents for the betterment of their communities.

Moreover, general education serves institutional purposes by providing integration and imprinting a mission and identity on the educational program. In the complex landscape of college students’ lives, general education offers a unique context for integrative learning [13]. It allows students to make connections and meanings across diverse academic disciplines and experiences. By facilitating integrative learning, general education helps students navigate the fragmented nature of their education and develop a comprehensive understanding of knowledge. Additionally, general education influences an institution’s educational program and reflects its mission and identity. It contributes to framing and fulfilling the overall educational philosophy of a college or university [17,18]. The general education curriculum, which is mandatory for all students, becomes a reflection of an institution’s values, goals, and educational mission [19]. Thus, general education plays a critical role in shaping the institutional identity and ensuring that the educational program aligns with the institution’s overarching mission.

2.2. Approaches to General Education

Walker and Soltis (1997) summarize three approaches to general education that reflect institutional academic values and intended learning outcomes: the first is a subject-centered approach that focuses on transmitting knowledge to the next generation, and general education is delivered by teaching basic skills, critical thinking, and mastery of important facts and information; the second is a society-centered approach that focuses on creating and ensuring a prosperous and healthy society, so the aims of education focus on civic responsibility, vocational training, ethical values, development of democratic attitudes, and the preparation of individuals for an industrialized society and for economic competence; and the third one is an individual-centered approach, which emphasizes the importance of individual freedoms, talent, and happiness, developing the student's potential, and preparing them for community life [20].

Aldegether (2015) points out that there are three perspectives on general education requirements, namely the traditional or conservative perspective, the multicultural perspective, and the radical perspective [21]. Each of these perspectives holds a different view of academic values and hence the direction of education. The traditional perspective emphasizes the importance of the classical curriculum, which deals with how to live right and suggests teaching the courses for that purpose in their original texts. The multicultural perspective emphasizes that general education should include multiple perspectives rather than a single-knowledge perspective to help students search for reliable knowledge about the world by teaching them to use their own judgments on what they read or learn about and what is happening around them. The radical perspective emphasizes the importance of critical pedagogy through which educators and students can think critically about how knowledge is produced and transformed in relation to the construction of social experiences and help students change their current social practices. In brief, Aldegether's summary draws the distinctions by knowledge-based, society-based and individual-agency-based and resonates with Walker and Soltis' categorization of subject-centered, society-centered and individual-centered.

2.3. Models of General Education

Models of general education play a crucial role in structuring the core curriculum for undergraduate students. Several models have been identified and elaborated upon in the literature, each with its own advantages and challenges. This section summarizes different models of general education and their key features.

The liberal arts model emphasizes a well-rounded education in the humanities, social sciences, and natural sciences [22]. It originated from the classical curriculum of colonial colleges and focuses on subjects such as literature, history, philosophy, and foreign languages. However, it does not include distribution requirements in natural or social sciences. While this model develops critical thinking skills, it has been criticized for prioritizing subjects distant from the practical skills valued by employers [23].

The core model of general education assumes the existence of a discrete body of knowledge that every educated person should know [24–26]. It requires all students to complete a series of prescribed interdisciplinary courses outside their academic department. The core model promotes interconnections across different disciplines, diverse methodologies, and various ways of viewing the world. However, designing and sustaining these courses can be expensive, and students may struggle to see the benefits, particularly if they are more focused on their majors [26].

The distribution model requires students to take a certain number of courses in different subject areas, such as humanities, social sciences, and natural sciences [27]. This model aims to provide breadth and exposure to a wide range of ideas. It introduces students to various disciplines and their bodies of knowledge and methodologies. However, one challenge is that students may prioritize ease or schedule convenience over actual learning [26,28]. Students may also perceive these requirements as arbitrary hoops to jump through without clear value or connection to their personal or professional goals [29].

In the thematic model, courses are organized around a central theme or set of themes to provide students with a coherent and integrated education that helps them understand the connections between different subject areas. By structuring courses around a theme, it offers students the opportunity to explore a specific theme or set of themes in depth, while also gaining a broad understanding of various disciplines and perspectives [30].

The competency-framed model focuses on individual abilities and skills of learning and personal growth [24]. It emphasizes the development of specific competencies rather than the acquisition of specific content knowledge. This model allows for overlap with the requirements of the major and focuses on transferable skills. However, it presents challenges in determining the distinctiveness and necessity of general education courses outside the major, as well as coordination and communication between faculty and administrators [31].

In practice, many institutions employ a hybrid model that combines elements from different models to create a unique program that meets their specific needs. Hybrid models can include thematic strands, core-distribution approaches, or combinations of core, distribution, and competency elements [26,32]. These hybrid models aim to integrate different perspectives and requirements and provide students with a more comprehensive and personalized educational experience.

Overall, the selection of a general education model depends on the goals and values of an institution, as well as the desired outcomes for undergraduate students. Each model has its own strengths and weaknesses, and institutions often strike a balance by adopting a combination of models that best suits their educational philosophy and student needs.

2.4. Theoretical Framework

To gain insights into the organizational aspects of developing, implementing, and supporting general education programs in alignment with the university's overarching goals, this study employs Bolman and Deal's (1991) four frames of organizational thought, namely the structural, human resources, political, and symbolic frames, as its theoretical framework [33]. These frames offer distinct perspectives that shed light on the functioning of organizations and can be effectively applied to comprehend the nature and operation of general education. By using these frames, this study aims to gain a comprehensive understanding of how general education operates within an organizational context.

Structural frame: The structural frame emphasizes the importance of formal roles, responsibilities, and organizational structure. It views organizations as systems that adapt to their environment and allocate resources and responsibilities accordingly. In the context of general education, this frame suggests that colleges and universities have established goals and objectives, and the curriculum is structured to achieve those goals. General education courses provide a foundational knowledge base and ensure coordination and integration across different academic disciplines.

Human resources frame: The human resources frame focuses on the interdependence between individuals and organizations. It recognizes that organizations are composed of people with diverse needs, skills, and values. In the context of general education, this frame emphasizes the personal and professional growth of students. It seeks to align educational experiences with students' needs and values, allowing them to develop critical thinking, analytical skills, and informed value judgments. The human resources frame values relationships beyond formal organizational structures, encouraging students to engage in holistic learning experiences.

Political frame: The political frame views organizations as arenas where different interest groups compete for power and resources. It acknowledges the presence of conflicts and the diverse perspectives and needs among individuals and groups within an organization. In the context of general education, this frame recognizes the existence of power dynamics and the distribution of resources within educational institutions. It suggests that decision-making processes, resource allocation, and curriculum design can be influenced by various stakeholders, including institutional leaders, faculty, administrators, students, and external forces.

Symbolic frame: The symbolic frame emphasizes the social and cultural aspects of organizations. It recognizes that organizations are driven by symbols, rituals, ceremonies, stories, and myths. In the context of general education, this frame highlights the importance of the educational institution's culture, values, and history. General education serves as a manifestation of an institution's educational philosophy and reflects its distinctive characteristics. It may also be exploited as legitimacy or norms set by benchmark institution in the field. Symbolic elements, such as institutional traditions, educational experiences, and shared values, shape students' perceptions and contribute to their overall educational journey.

By employing Bolman and Deal's (1991) four frames, the analysis of general education can encompass the structural aspects of curriculum design and organizational goals, the interpersonal and developmental aspects of student growth, the power dynamics and resource allocation processes, and the cultural and symbolic elements that shape the educational experience. This multidimensional approach provides a comprehensive theoretical framework for examining general education and understanding its role within the larger educational landscape.

3. Research Methodology

The case study method is considered the most appropriate approach for this study, as it allows a detailed investigation of a specific social phenomenon in its real context [34]. For this study, a single case study design was chosen to comprehensively examine the development and support of institution-wide, individualized, and innovation-centered general education at a specific university where the authors are action researchers and can access the actual process of decision making and implementation. This approach aimed to gain a comprehensive understanding of the complex social phenomena involved in cultivating innovative talents at the case university.

3.1. Case Selection

The selection of Southern University of Science and Technology (SUSTech) as the case university for this study was based on its unique characteristics and its pioneering role in developing a comprehensive general education model. As a university entrusted by the Ministry of Education to explore the establishment of a modern university system and an innovative talent cultivation model, SUSTech differs from other Chinese universities in its emphasis on integrating general education throughout the institution to promote students' self-directed thinking. Located in Shenzhen, a city with a limited number of higher education institutions despite its large and young population and thriving economy, SUSTech was established to address the demand for fundamental research, high-level talent, and sustainable development. With the opportunity to start anew, SUSTech strives to become a world-class university by drawing from the best practices of excellent universities worldwide and attracting faculty members with extensive international backgrounds. SUSTech's success is evident in its rankings and reputation, attracting students with ever-improving academic preparation. While still in its nascent stage, SUSTech awaits the test of time to fulfill its mission of cultivating innovative talents who will grow into leading scientists and engineers.

3.2. Data Collection and Analysis

To ensure a comprehensive dataset to gain insights into the organizational aspects of developing, implementing, and supporting general education programs in alignment with the case university's overarching goals, multiple data collection methods were employed. (1) Various university documents were collected, including policies, strategic plans, regulations, and minutes of general education-related meetings. These documents offered insights into the formal roles, responsibilities, and organizational design of the general education program. They provided a foundational understanding of how the goals and objectives of general education were structured, as well as how resources and responsibili-

ties were allocated within the university environment. (2) External reports from reputable sources, such as university rankings and external quality evaluations, were gathered to display the external perceptions and recognition of the case university's general education initiatives. (3) The researchers employed a participant observation approach in which they directly observed the implementation of general education programs, interactions among institutional leaders, stakeholders, and the general environment and culture surrounding general education within the case university. (4) Focus groups and discussions involving faculty, administrators, and students were conducted in the university's natural setting to gain different perspectives and insights related to general education and to triangulate the findings the researchers had obtained from other data. By engaging these stakeholders, the interdependence between individuals and the organization was explored, allowing for a comprehensive understanding of personal and professional growth opportunities for students.

Data collected through various methods were rigorously analyzed and carefully integrated to gain a comprehensive understanding of the establishment and implementation of general education within the new research university. (1) University documents and external reports were subjected to a thorough content analysis. Recurring themes, goals, and strategies contained in these documents were identified. The structural and political frames were used to examine how the university formally outlined its approach and resources to general education. The insights gained in this part shed light on the goals and structural dimensions of the general education at the case university. (2) Participant observation data in the form of researcher notes, narrative descriptions, audio and video documents, and visual documents and comments were analyzed through iterative coding and thematic analysis. This qualitative approach allowed the researchers to gain a comprehensive understanding of the implementation of the general education program in the university context. Observations were viewed through the lens of both human resources and symbolic frames. The human resources frame shed light on how individuals' interactions and behaviors contributed to the program's effectiveness in fostering holistic student growth. The symbolic frame, on the other hand, provided insights into the cultural nuances and institutional values that manifested in the observed practices. The findings with this lens are presented in the implementation, structural, pedagogical, and integrative dimensions of the general education at the case university. (3) Data collected in the focus groups and discussions were subjected to thematic coding and qualitative analysis to identify recurring themes and underlying patterns in participants' narratives. Findings from the focus groups were viewed with structural, human resources, and symbolic frames to gain insights related to general education and to triangulate the findings that the researchers had obtained from other data.

Integrating data from these different sources was a meticulous process that involved triangulation to ensure credibility and validity. Findings from each method were cross-referenced to provide a nuanced and comprehensive understanding of the multiple dimensions of the general education program. Findings from university documents and external reports provided context for the observed practices and discussions. Similarly, participant observation and focus group data enriched each other by offering different perspectives on the same phenomenon. The integration of these data sources facilitated a holistic analysis that culminated in a coherent interpretation of the complex organizational dynamics that shape general education at the research university.

4. Research Findings

SUSTech stands as a unique example of this transformative approach to general education. Its methodology defies easy categorization because it goes far beyond the boundaries of conventional curricular discussions. Instead, SUSTech's general education embodies a multifaceted approach that is interwoven with the university's core missions and unique historical path and embedded in its own structure. Intricately serving multiple functions, SUSTech's general education program not only nurtures student learning but

also fosters communal well-being while integrating the institution's overarching mission into its educational endeavors. The result is a distinctive model that combines elements from multiple educational paradigms, as discussed in the literature review.

In order to gain insight into the organizational intricacies associated with designing, implementing, and sustaining general education initiatives that align with the overall goals of the university, a detailed description of SUSTech general education is used to provide readers with a clear picture. In order to comprehensively present the development, implementation, and support aspects of SUSTech's general education paradigm from an organizational perspective, the findings are structured into five dimensions that together comprise the description of SUSTech's general education.

- ◆ Goal dimension: innovation and excellence as drivers of institutional advancement;
- ◆ Implementation dimension: continuous exploration and adaptation;
- ◆ Structural dimension: a whole-institution approach;
- ◆ Pedagogical dimension: a student-centered approach;
- ◆ Integrative dimension: enriching the educational experience through a holistic, immersive approach.

This description of the different dimensions illustrates the complex interplay that makes up SUSTech's innovative approach to general education.

4.1. Goal Dimension: Innovation and Excellence as Drivers of Institutional Advancement

In 2009, Professor Qingshi Zhu embarked on his journey as the inaugural president of SUSTech following an extensive global search. An academician of the Chinese Academy of Sciences and a renowned higher education leader widely known for his reform mindset, President Zhu's vision for this new university was influenced by the famous question posed by Academician Xuesen Qian (1911–2009), a prominent scientist—"Why have Chinese schools rarely produced truly outstanding talents?" The so-called Qian's Question was raised in his meeting with the then Prime Minister Jiabao Wen and has ever since become the classical educational conundrum that has bedeviled Chinese educators. The question raised existing criticism about Chinese universities to a level that led to heated debates nationwide. In response, President Zhu declared that the mission of SUSTech is to answer Qian's Question by developing into one of the best universities in China that fosters real capabilities in students and trains them to be talent needed by the society upon their graduation.

In December 2010, the Ministry of Education approved preparations for the establishment of SUSTech and set a preparation period of three years. In April 2012, after concerted efforts by visionary SUSTech people, higher education leaders, and government leaders, the Ministry of Education approved the official establishment of SUSTech ahead of schedule and entrusted to SUSTech the two-pronged mission of "exploring the establishment of a modern university system" and "developing an education model for the cultivation of innovative talents". In parallel with the formal process of the Ministry of Education, SUSTech undertook action to form a legitimate mission statement for itself by deriving the key messages firstly from a meeting in December 2009 between President Zhu and Mr. Guiren Yuan, the then-minister of the Ministry of Education, and secondly from the national education reform policy, Outline of China's National Plan for Medium and Long-term Education Reform and Development (2010–2020) released in July 2010 [35]. In early 2012, the formal description about the University ran as follows:

South University of Science and Technology of China (SUSTC) (In English, the University was named by President Zhu as South University of Science and Technology of China. In 2016, the English name was officially changed to Southern University of Science and Technology in the term of the second president Professor Shiyi Chen.) is a higher education institution built with new thinking and mechanism in the backdrop of Chinese higher education reform and development and by the Shenzhen Municipal People's Government to implement the directives of "The Plan outline of the national

mid-term and long term education reform and development” and “The plan outline of the Pearl River Delta reform and development” (2008–2020).

SUSTC is an experiment in comprehensive reform for Chinese higher education and carries the significant mission to explore for an education model in China that cultivates innovative talent. . . SUSTC shall borrow from the education models of the world-class universities, innovate the system and mechanism for its operation. . . with goals and self-positioning to become an international high-level research university, and to become a key base for major scientific and technological research and the cultivation of excellent and innovative talents. (SUSTC, 2012)

Whether it is “truly outstanding talent” in Academician Qian’s terms or “real masters”, “excellent and innovative talent” in President Zhu’s terms, excellence and innovation have become the two key words that direct pathways for the education reform efforts at SUSTech, with the educational goals of raising leading scientists and engineers for the future. To realize this mission, the University decision-makers chose general education, which is intended to be both broad-based and individualized, as an important mechanism for coordinating curriculum, pedagogy, and administration. The characteristic of being broad-based was widely accepted at the time, thanks to China’s general education experiments in the former decades. The concept of individualized education arises from the belief that innovative talents should be able to think independently and ‘out of the box’, a quality not traditionally fostered by the basic education in China, where exams dictate what students learn and why, and students learn by drills and memorization of knowledge.

In response, SUSTech educators needed to address, first, in the education process how to help students find their real interests, increase their motivation to learn, and grow individually; and second, how to support students’ individual learning needs. In practice, they have found that the key is to guide students to find their own path based on knowing themselves and discovering their true passion. Personal commitment leads to engaged learning and thus to excellence. By devoting the first year or two of college to general education before deciding on a major, SUSTech students can make a choice rather than relying on a poorly informed decision about a major before entering college. To a certain extent, the experiment at SUSTech embodies the development of individual subjectivity and the cultivation of personhood.

The guiding principles of innovation and excellence permeate not only the pursuit of educational excellence but also the institutional growth of SUSTech. Since its birth, SUSTech has aimed to develop into a world-class university in a remarkably short period of time by breaking free from the constraints of established Chinese universities and by drawing inspiration from the best practices of excellent universities around the world. The opportunity to establish the university from scratch in the reform-minded and prosperous City of Shenzhen proved to be an advantage for SUSTech to create a high-level system that successfully supports its education ideas [36]. When President Zhu finished his term in September 2014, SUSTech had 107 faculty members in place, about 1000 undergraduate students, and 16 undergraduate degree programs.

During the term of President Shiyi Chen (2015–2020), SUSTech advanced upon the foundation laid by President Zhu. By the end of 2020, when President Chen finished his service, SUSTech had about 1000 faculty members, most of whom have extensive international backgrounds (50% tenure-line, close to 50% research track, and about 100 teaching track faculty members); 4374 undergraduate students, 3186 graduate students; 34 undergraduate degree programs that cover sciences, engineering, business, life science, and medicine; 8 master’s degree programs; 4 doctoral degree programs; and a revenue about 10 times of the 2014 revenue. The numbers demonstrate the leaping forward progress of the university, and quality is never neglected. All tenure-line faculty members are PhD holders, with more than 90% of them having overseas education and work experience, more than 60% of them from the world’s top 100 universities and about 28% hold a foreign passport. English is the instructional language on campus. The faculty body is capable of teaching in English,

conducting world-class research aided by international exchanges and collaboration, and is comfortable with student advising.

The success of young SUSTech is attested by rankings. According to the 2021 World University Ranking by Times Higher Education, SUSTech was ranked No. 8 among mainland Chinese universities with the highest publication quality in China and ranked 250–300 worldwide. In the QS 2021 World University Ranking, SUSTech was No. 14 among mainland Chinese universities and No. 1 in the student–faculty ratio. In the Shanghai Ranking 2020 for mainland Chinese universities, SUSTech was No. 8 for high-level academic hires. In *Nature Index 2020*, SUSTech ranked 15th in China, and 61st in the world.

The academic excellence of the faculty body and the elevated institutional reputation through world rankings reinforced the legitimacy of SUSTech’s educational innovation in the marketplace. Over the years, SUSTech has attracted students with better academic preparation and greater understanding of what SUSTech offers. By 2020, SUSTech students came from 22 provinces/directly administrated cities all over China. They are selected through a combined score consisting of the National College Entrance Examination score (60% of the total), a SUSTech administrated examination score (25% computer-based, multiple-choice examination and 5% interview), and high school performance record (10%). According to their standardized National College Entrance Examination scores, the students admitted by SUSTech are in the top 10% of high school graduates, and students enrolled from 10 out of the 22 provinces/directly administrated cities are in the top 1%. When they graduate, 1/3 of them go to overseas graduate programs, 1/3 to domestic graduate programs, and 1/3 to work in companies. Since the graduation of the first cohort, the University has adopted the practice of publishing reports or interviews of excellent graduates that review the trajectory of their college years, highlighting the connection of their personal growth and accomplishments with individual exploration enabled by university opportunities and resources. By giving special publicity to these high-achieving students, SUSTech sets examples for the student body to learn from and emulate. The students’ stories also attract prospective students who are drawn to the freedom and independence of a SUSTech education, and along with their parents, promote SUSTech’s market recognition, which in turn reinforces the innovative education efforts at SUSTech. By the summer of 2020, SUSTech had only six graduating classes. It awaits the test of time to see whether its goal of cultivating innovative talent to become leading scientists and engineers is to be fulfilled.

In retrospect, many factors have contributed to the miraculous success of SUSTech, which include, but are not limited to, the generous financial support from the municipal government, the continuous commitment of university leadership, the national ambition to develop world-class universities, and the overall ethos of the public in favor of aligning Chinese universities with the world’s top universities. SUSTech is the first mainland Chinese university in the People’s Republic of China to establish a collective Board of Regents for the presidential search, to reverse the brain-drain trend by hiring more than 90% of faculty members from around the world, and to adopt a college admission assessment mechanism that does not rely solely on the National College Entrance Examination. Many factors and institutional mechanisms support SUSTech in successfully implementing the talent cultivation goals articulated by older generations of educators [37]. The opportunity to start a university from scratch with no historical burden enables SUSTech to apply the most up-to-date knowledge about how to build a university for the future. General education functions as a lynch pin in SUSTech’s reform system and is linked to a variety of education mechanisms that perhaps develop separately at other institutions. To a certain extent, this study may argue that general education at SUSTech is both significant and tactical, like a stored solution that finds its problem [38].

4.2. Implementation Dimension: A Continual Exploration and Adaptation

SUSTech, a STEM (Science, Technology, Engineering, and Mathematics) university, is viewed as a pioneer in cultivating future leading scientists and engineers and a testbed for

higher education reform in China. General education plays a vital role in SUSTech's reform efforts, and defining its scope and content has been a critical issue from the beginning. SUSTech's curriculum designers studied the experience of general education in American and European universities, as well as the nature of STEM learning, to inform their decisions.

In developing the curriculum, SUSTech combined the traditions of liberal education in Europe with the models of general education in the United States. This entailed an amalgamation of classical literature, philosophical discourse, historical knowledge, language proficiency, skill cultivation, and interdisciplinary cognition. As a result, a set of attributes that SUSTech aspires to cultivate within its undergraduates crystallized: extensive knowledge about science and the world, an in-depth understanding of humanity, society, and history, and an ethical consciousness coupled with a sense of social responsibility.

The inceptive STEM-centric phase: The first phase of general education curriculum development at SUSTech involved a proactive five-year period of exploration in which the university embraced its identity as a preeminent STEM institution, inspired in part by the California Institute of Technology model. General education during this phase prioritized a comprehensive understanding of the scientific domain embodied in courses in calculus, linear algebra, physics, chemistry, biology, and computer science.

While STEM knowledge was emphasized, SUSTech also aimed to foster students' overall development by expanding their knowledge of the world and enhancing their intrapersonal intelligence. Because SUSTech initially had a limited number of faculty members in the humanities and social sciences, the university had to explore innovative approaches to teaching general education. This involved carefully selecting MOOCs (Massive Open Online Courses) and offering interdisciplinary courses delivered by guest faculty, which formed the core of the humanities, arts, and social sciences (HASS) curriculum during this period.

The evolutionary elaboration phase: The subsequent phase of general education development at SUSTech was marked by the blossoming of HASS offerings, the introduction of English medium instruction, level-appropriate STEM courses, and the integration of co-curricular education at the residential colleges for whole-person development. With an enlarged cadre of faculty, expanded course offerings, and increasing interdisciplinarity, the contours of general education were rapidly expanding. At this stage, SUSTech's aspirations resonated with the Stanford University model. Formative milestones encompassed the establishment of pivotal centers, including the Center for the Humanities, the Center for Social Sciences, the Center for Higher Education Research, the Center for Language Education, and the Arts Center, which eventually merged to form the College of Humanities and Social Sciences. These centers were instrumental in adding depth, diversity, and structural coherence to SUSTech's general education landscape. In addition, tiered STEM courses were introduced to accommodate the varying entry levels of students and the requirements of different degree programs. An example of this is the division of the course of Calculus into Mathematical Analysis, Calculus A, and Calculus B, to accommodate different academic backgrounds. Offering bilingual and English-medium classes encouraged individual academic challenges and strengthened students' future competitiveness. This phase also witnessed innovation in the prescribed political and moral education modules, culminating in the merging of co-curricular undertakings within SUSTech's residential colleges and the participation of esteemed scholars on the theme of "China and Modern Science and Technology". General education in this phase emphasized a comprehensive and individualized STEM foundation, interdisciplinary HASS engagement, innovative pedagogical approaches, and integrated ethical education, promoting students' autonomy in pacing their learning journey and fostering interdisciplinary intersections.

4.3. Structural Dimension: A Whole-Institution Approach

SUSTech takes an innovative and systematic approach to undergraduate education by carefully integrating general education courses with subject-specific content from different academic departments. This harmonious integration not only provides students with a

range of intellectually stimulating learning experiences, but also creates a deep sense of coherence throughout their academic journey. Characterized by a comprehensive, institution-wide structure, SUSTech's approach to undergraduate education underscores its commitment to nurturing well-rounded and capable graduates. This institutional philosophy manifests itself in the design of a four-year general education framework with special emphasis on the pivotal first year of study and the incorporation of residential college structures that prove to be powerful catalysts for students' holistic development. In addition, SUSTech employs a mixed-class course system that caters to both domestic and international students, which is a marked departure from the prevalent separate international college model adopted by other prominent Chinese universities.

Central to SUSTech's general education scheme is the pivotal first year, during which students begin their academic journey by enrolling in general education courses. This foundational phase not only stimulates intellectual curiosity, but also gives students the privilege of choosing a major at the end of their first year. A cornerstone of the general education curriculum is the STEM module, which takes on special importance during this initial stage of study. This module consists of a constellation of courses that include calculus, linear algebra, physics, chemistry, biology, and computer science—each of which is carefully tailored to meet the requirements of the various majors and serves as a foundation from which students can explore their academic interests and identify possible directions to help them make informed decisions about which major to pursue. The curriculum also includes a selection of general education courses offered by each degree program. These courses have been intentionally designed to extend beyond the boundaries of the chosen major and serve as a solid foundation for future interdisciplinary exploration, strengthening students' capacity for interdisciplinary innovation. After deciding on a major, students have the option of taking the science elective at their own pace.

In consonance with SUSTech's holistic vision, students must complete credit hours in the humanities module, the social sciences module, and the music and arts module. The humanities courses promote an understanding of a variety of classical Chinese and Western literary works and encourage students to critically interpret and analyze elements such as genres, thematic nuances, and historical contexts. By situating the humanities disciplines in their historical and cultural contexts, students are able to use this knowledge for creative thinking and effective problem solving. Courses in the Social Sciences module aim to provide an understanding of social and cultural diversity, social science theories, research methods, and the art of social research. This curriculum fosters critical thinking skills by training students to observe and analyze social phenomena with a discerning eye. The music and arts module emphasizes an appreciation of artistic expression and provides students with opportunities to interpret both traditional and contemporary artistic expressions. The module not only teaches interpretive skills, but also encourages student engagement with art forms such as music, drama, dance, and fine arts. Through this multi-faceted curricular approach, SUSTech students receive a comprehensive education that combines STEM fundamentals, language skills, humanistic insights, social science perspectives, and a cultivated appreciation for the arts. These interdisciplinary encounters foster the development of creativity, critical thinking, and problem-solving skills and prepare students for the diverse challenges of their future careers.

The essence of SUSTech education lies in the seamless interplay of general education and discipline-specific learning, resulting in a comprehensive and cohesive learning experience. This harmonization enables students to apply their acquired knowledge and skills both within and outside their chosen disciplines and to develop solutions to real-world problems in a variety of contexts. This integration, in turn, leads to holistic personal, professional, ethical, and intellectual development. The institutionalized system of general education supports students' development in their chosen fields of study and beyond by providing them with required and elective courses that promote the acquisition of comprehensive knowledge and skills, advance the development of a growth-oriented mindset, and facilitate holistic personal maturation.

Complementing this educational paradigm are the residential colleges that serve as focal points for students' holistic development. These residence colleges go beyond mere housing and become the core of students' personal and communal development. In this supportive environment, students participate in interactive, extracurricular learning activities and mature cognitively, emotionally, and socially. Each SUSTech student is assigned to a residential college and is matched with a faculty advisor through a mutual selection process. These college life advisors, who are distinguished faculty members themselves, provide advice drawn from their academic backgrounds and life experiences, and often serve as exemplary role models for their advisees. To facilitate this interactive type of college education, SUSTech maintains a favorable faculty–student ratio of 1 to 10 to ensure that each student receives the attention and support they need.

The mission of SUSTech's residential colleges extends beyond the functions of housing and personal counseling to educating students to become proactive agents who can contribute positively to society. The colleges are crucibles that foster students' social development by having all students participate in various social practice projects. These initiatives are an integral part of the moral education module within the general education curriculum and are worth five credits. In collaboration with academic units, the residential colleges design and implement hands-on learning experiences that provide students with a conducive environment to explore their interests, enhance their self-awareness, promote social responsibility, and provide them with lifelong learning skills through collaborative learning, extracurricular engagement, special interest groups, and joint endeavors. The residential colleges are also crucibles for esthetic education, which manifests itself in the various student clubs and societies in the areas of chorus, theater, dance, folk music, symphony, and fine arts. Each residential college maintains its own constellation of clubs and encourages students to cultivate their sense of beauty in various artistic dimensions.

The particular structural dimension of SUSTech's general education focuses on an all-encompassing institution-wide framework. This structural innovation underpins a commitment to comprehensive student development that is supported by the residential college paradigm that promotes holistic student development. SUSTech's overarching ethos is complemented by a course system that accommodates both domestic and international students. SUSTech's general education model is characterized by its flexibility, offering students the freedom to choose courses and classes taught in both bilingual and English formats. In a departure from the traditional approach, SUSTech does not mandate the completion of the entire general education package within the first year. Instead, students are free to take the general education courses in any semester, with the exception of the GE science module, English and Chinese writing courses, and courses required by the Ministry of Education. This academic flexibility is underpinned by the principle that "all courses are open to all students in all programs". This approach gives students the opportunity to design their own knowledge framework and shape their learning path according to their individual needs.

4.4. Pedagogical Dimension: A Student-Centered Approach

In discussions of general education, less attention is paid to the pedagogical aspect compared to curriculum design. However, pedagogy plays a critical role in establishing an emotional and intellectual connection between students and their educational experiences. At SUSTech, general education is underpinned by a student-centered pedagogical approach in which various components harmonize to create an integrated learning environment.

At the core of SUSTech's educational framework are carefully structured courses within the science module. These courses are strategically designed to provide step-by-step challenges that are aligned with the mathematical prerequisites of the various majors. This curriculum serves a dual purpose: it encourages students to explore their potential and prepares them for specialized courses of study. Courses in physics, chemistry, biology, and computer science are carefully tailored to different levels of complexity and address the specific pedagogical goals and content intricacies of each area. Advanced courses are

closely aligned with their respective disciplines, while subjects less related to upcoming academic paths are designed to foster a broader understanding and engagement with scientific and technological fields.

In the humanities, social sciences, arts, and foreign languages, SUSTech employs innovative and student-centered teaching methods. These approaches foster versatile problem-solving skills, effective communication, and the transfer of knowledge to new contexts. Small class sizes are maintained in language courses to meet individual learning needs and promote meaningful interactions with instructors and fellow students. Interdisciplinary general education courses such as “Language and Science”, “Interdisciplinary Solutions to Engineering and Social Problems”, “Art Design from Theory to Practice”, “Science in Science Fiction”, and “Innovative Space Design” are designed to challenge students’ understanding of real-world challenges, foster hidden talents and interests, increase self-confidence, and stimulate introspective thinking.

These pedagogical strategies transform the various components of general education at SUSTech into a coherent body of knowledge that promotes advanced cognitive skills. Students’ academic journeys are linked to critical issues that are supported by wise advising and careful mentoring. Academic planning, career development, course selection, choice of a major, research initiatives, social practices, internships, and senior theses are enclosed in a framework of thoughtful advising. The declaration of a major takes on special significance, allowing students to refine their choices and solidify aspirations. Comprehensive support mechanisms facilitate exploration during the freshman year, with STEM courses and introductory offerings providing the foundation for an informed choice. SUSTech’s overarching philosophy accommodates missteps and redirections, with courses for graduation and major declaration spanning both semesters, providing flexibility for up to six years to graduate.

At the heart of SUSTech’s general education structure is the dual-advisor system, which provides personalized and comprehensive support. Each student is served by two advisors: a college advisor during general education and an academic advisor when deciding on a major. Residential college advisors guide students towards discerning decisions during major declaration. College advisors assist with course selection prior to deciding on a major and continue to provide academic advising after a student has decided on a major. Faculty mentoring in the residential colleges may take a variety of forms, but it is accompanied by a minimum advising load of 50 h per year and a clearly defined advising protocol. Each of SUSTech’s six residential colleges consists of faculty members from different departments and organizes a range of activities to facilitate the transition of new advisors into their roles and to foster communities of practice to promote effective student advising. A “College Advisor of the Year” Award is presented each year to recognize outstanding advising performance.

At SUSTech, there is an additional layer of mentoring provided by academic advisors who offer guidance and supervision specifically related to degree programs. In some cases, college advisors also serve as academic advisors for students in their respective departments. Hence, the term “dual” applies to both students and advisors: students have dual advisors, while faculty members undertake the dual responsibility of general college life advising and discipline-specific academic advising. Both college advisors and academic advisors act as mentors with a comprehensive understanding of student development. They work closely with residential colleges, academic departments, and administrative offices to provide students with individualized and effective advising.

4.5. Integrative Dimension: Enriching the Educational Experience through a Holistic, Immersive Approach

The integrative dimension of SUSTech’s general education reflects the institution’s commitment to creating a diverse and connected learning environment. This dimension includes the integration of student research, study-abroad programs, and a new engineering education system that pushes the boundaries of general education.

A. Student research

Involving students in research projects is an important component of SUSTech's general education curriculum, even though it is not a required course. Undergraduate research, which includes independent investigations or research that contributes original findings to specific areas, is an integral part of SUSTech's pedagogical approach. SUSTech offers a wide range of opportunities for student involvement in research and encourages engagement through a variety of channels, forms, and methods. Students are encouraged to explore their research interests in depth and engage in dialogue with their advisors. Following required approvals, advisors facilitate early participation in laboratory observations to foster a hands-on, experiential understanding of critical thinking and problem-solving methods.

Many students subsequently embark on independent explorations by formulating their own research questions. These endeavors are supported by their advisors and can be pursued in a variety of ways, including undergraduate research projects offered by their respective departments, College Students Innovation and Entrepreneurship Projects, and other independent student research initiatives. It is common for SUSTech undergraduates to participate in their advisors' research teams, allowing them to engage in research under the guidance and supervision of experienced researchers. Some students even discover their interests and potential career paths through these research experiences, with initial results often being incorporated into their senior theses.

Following the declaration of their majors, conducting research projects under the guidance of advisors becomes a mandatory part of the degree program to foster a scholarly inquiry process that involves investigating, evaluating, creating, and disseminating knowledge or work aligned with the practices of the respective disciplines. Collaboration among students from different disciplines in undergraduate research is actively encouraged at SUSTech. The College Students Innovation and Entrepreneurship Projects program plays an important role in selecting, funding, and supporting approximately 120 undergraduate research projects each year, involving approximately 400 students. These projects emphasize originality, innovation, and in some cases, entrepreneurship, leading to the publication of research results in prestigious academic journals or the transformation of results into entrepreneurial products.

From an educational standpoint, engaging in research offers unique opportunities for students to learn and apply scientific principles. Through active participation in research, students develop scholarly thinking, hone their exploration and communication skills, and gain experience in project management, problem solving, research budgeting, proposal writing, and the complete research process. Additionally, research experiences have the potential to reshape students' perceptions of science and significantly influence their future career. Ultimately, undergraduate research at SUSTech serves not only to deepen students' academic understanding in their chosen disciplines but also to enable them to acquire a comprehensive skill set and broaden their horizons, preparing them for a successful future in their respective fields.

B. Study-abroad programs

Study-abroad programs are an important component of SUSTech's general education. One of the key objectives of undergraduate education at SUSTech is to equip students with the essential qualities they need to become global-minded and pioneering scientists and engineers in the future. Studying abroad serves as a crucial pillar and mechanism to foster students' global outlook. The study-abroad programs offered at SUSTech encompass a wide range of options, including summer/winter programs, research camps, semester/year-long exchange programs, and dual degree programs. Since their inception in 2015, more than 2000 students have participated in and benefited from these programs.

These study-abroad programs have a wide variety in terms of their objectives, content focus, duration, formats, partner institutions, and disciplinary areas. At the university level, comprehensive support and encouragement are provided to undergraduate students throughout their study-abroad journey. This support includes assistance with scholarship

applications, selection of partner universities, project design, development and confirmation of study plans, credit transfer processes, and opportunities for sharing experiences upon return. The benefits of participating in study-abroad programs go beyond enhancing global awareness and academic learning. They also encompass the development of leadership skills, personal growth, and the acquisition of greater cultural competence.

Analysis of students' self-reports following their completion of study-abroad programs reveals significant progress in several areas. These developments include, but are not limited to, improved academic skills, language acquisition, deeper understanding of scientific concepts, enhanced academic planning skills, self-discovery, social identity formation, critical thinking, and emotional growth. These findings underscore the transformative impact of study-abroad experiences on SUSTech undergraduate students.

C. New engineering education system

The integration of a new engineering education system at SUSTech plays a crucial role in expanding the scope of general education beyond traditional boundaries. As a STEM-focused university, SUSTech attracts a significant number of students to its engineering programs. The adoption of the new engineering education mode serves as a driving force for the advancement and innovation of undergraduate general education at the institution.

Under this educational approach, students are given more autonomy to shape their individual knowledge and skill structure. They have access to abundant resources and interdisciplinary learning opportunities that allow them to define their own learning content and pace. The new engineering education model goes beyond traditional approaches by placing a strong emphasis on addressing complex societal needs. It recognizes the importance of understanding the needs of people and society, which requires a comprehensive and integrative approach that goes beyond discipline-specific education.

The general education modules, particularly in the humanities, social sciences, arts, ethics, integrative residential college education, and student research project schemes, collectively contribute to preparing engineering students to benefit fully from the new engineering education at SUSTech. These modules promote a holistic and coherent learning experience that enables students to engage with diverse perspectives and develop the skills needed to meet the challenges of the 21st century.

By integrating general education with the new engineering education system, SUSTech creates a student-centered and future-oriented approach that effectively addresses societal, environmental, and technological challenges. This integration creates a novel paradigm for college learning that promotes curricular coherence, interdisciplinary connections, and a focus on imagination, creativity, and innovation.

Over a decade of rigorous experimentation and development, SUSTech has developed an innovative and comprehensive general education system that incorporates multiple components. This system seamlessly integrates a well-rounded curriculum, individualized curricula, and an integrated residential college education. Its primary goal is to foster students' exploration of their inherent capabilities, cultivate their ability to think beyond their specialized areas, and equip them with essential skills for lifelong learning and critical thinking. Noteworthy characteristics of SUSTech's general education include its institution-wide approach, seamless integration with students' major declaration and learning processes, student-centered pedagogy, a versatile residential college co-curriculum system, and an extensive support system.

5. Discussions

In China, the last decade has witnessed a significant rise in higher education programs focusing on general/liberal education, which adopt a holistic educational philosophy and aim to equip lifelong learners with integrated knowledge and a sense of social responsibility. This shift represents a departure from the traditional utilitarian Chinese curricula that prioritized specialized professional training [39]. It also displays some of the reform efforts by education leaders to overhaul China's higher education institutions. The general education curriculum plays a pivotal role in instilling educational values and aspirations,

incorporating perspectives from various stakeholders, and encompassing social, cultural, economic, and governmental factors [27].

In response to these evolving global trends and the aspiration of becoming a world-class university, the case university of this study has embarked on a comprehensive and innovative journey to establish a robust general education system. Over the course of a decade, SUSTech has undertaken rigorous experimentation and development to create a holistic educational experience for its undergraduate students. This system integrates various components to provide students with a well-rounded education that extends beyond their specialized areas of study. The primary focus of SUSTech's general education approach is to foster students' exploration of their inherent capabilities and nurture their critical thinking skills. This is accomplished through the implementation of a well-rounded curriculum, personalized learning, and an integrated co-curricular education.

SUSTech's general education system stands out due to its institution-wide approach, which ensures that the principles and goals of general education permeate every facet of the university. The system seamlessly aligns with students' major declaration and learning processes, creating a cohesive educational pathway that connects different disciplines and areas of study. By adopting a student-centered pedagogy, SUSTech empowers students to actively shape their learning experiences and align their education with their individual interests and aspirations.

Complementing the academic aspects of general education, SUSTech enhances the overall educational experience through its residential college co-curricular system. This system provides students with a versatile platform for experiential learning, leadership development, and cultural immersion. Through a wide range of co-curricular activities, students broaden their perspectives, expand their networks, and develop essential life skills that complement their academic endeavors.

Students are supported throughout their general education journey by a comprehensive support system provided by SUSTech. This includes a 1:10 to 11 faculty-to-student ratio, faculty time protected by on-campus housing, and mentoring, guidance, and resources from advisors who help students in navigating their academic and personal development. This is to ensure that students receive the support they need to maximize their general education experience and reach their full potential.

In examining the implementation of general education at SUSTech, the theoretical framework proposed by Bolman and Deal (1991) in their four frames of organizational thought—the structural, human resources, political, and symbolic frames—provides a valuable lens [33].

From a structural frame perspective, SUSTech's general education system takes an institution-wide approach that ensures that the principles and goals of general education permeate every facet of the university. This structural design allows for a cohesive and interconnected educational journey that is integrated with students' major declaration and learning processes. By embracing a student-centered pedagogy, SUSTech empowers students to actively shape their learning experiences and align their education with their individual interests and aspirations.

From a human resources frame perspective, SUSTech's general education system emphasizes personalized study plans that enable students to make choices and explore interdisciplinary perspectives. This approach recognizes the interdependence between individuals and organizations and provides students with abundant resources and opportunities to engage in interdisciplinary learning and to determine their own learning content and pace. The system promotes the development of critical thinking, analytical skills, and informed value judgments, and encourages personal and professional growth supported by formal organizational structures.

From a political frame perspective, SUSTech's general education system has been consistently maintained by university leadership and recognizes the diverse perspectives and needs of stakeholders. The system encourages collaboration among different academic departments, facilitates interdisciplinary learning, and promotes a holistic educational

experience. The residential college co-curricular system, serving as a symbol of the political frame, provides students with a platform to engage in experiential learning, leadership development, and cultural immersion. This system promotes social and intellectual growth by integrating domestic and international students into a unified educational environment. By embracing this inclusive approach, SUSTech enhances students' understanding of different perspectives and cultivates a collaborative spirit, laying the foundation for a well-rounded education.

From a symbolic frame perspective, SUSTech's general education system acknowledges the social and cultural dimensions of education. The system incorporates various mechanisms identified as successful practice in the world's top colleges and universities, including residential colleges, dual-advisor mentorship, freedom in course selection and major declaration, the integration of general and major education, and student research support. These elements play a significant role in shaping students' perceptions and contributing to their overall educational experience. By incorporating rituals and shared experiences, SUSTech creates an inclusive and supportive environment that goes beyond mere rules and policies. This fosters a strong sense of belonging and identity among students and enhances their engagement and personal growth.

While SUSTech's general education system represents an innovative and comprehensive approach, there are areas that require attention and improvement. Striking a balance between general education and major-related studies is crucial, as faculty concerns about the heavy load of general education courses and their potential impact on specialized learning should be addressed. Clear communication of learning outcomes is essential to enhance student engagement and motivation. Additionally, adopting a comprehensive and systematic assessment framework that encompasses the entire general education system will provide valuable insights into its effectiveness and facilitate continuous improvement.

SUSTech's implementation of general education serves as an innovative and pioneering experiment in the Chinese higher education landscape. By bridging the gap between general and specialized education, SUSTech prepares its students to become self-directed thinkers capable of making informed decisions based on broad knowledge and reasoned ideas. The university's commitment to general education aligns with the national demand for innovative talents and its dedication to educating a new generation of leaders for scientific and technological advancements.

6. Conclusions

SUSTech's journey in developing and implementing a robust general education system implies the importance of taking an institution-wide approach and adopting an innovation-centered perspective. By ensuring the integration of general education principles and goals across all aspects of the university, SUSTech creates a cohesive and interconnected educational pathway for students. The innovation-centered approach at SUSTech imparts a liberal sense to general education by empowering students to become self-directed thinkers with inquiring minds and the intellectual tools to think independently. By focusing on awakening students' self-awareness, interests, passions, and visions for the future, SUSTech cultivates students who are able to make personal decisions based on broad knowledge, well-reasoned ideas, and values.

This case study of SUSTech also demonstrates the importance of educational ideas of institutional leadership, organizational support, systematic design, concerted effort, and financial support in creating a successful general education system. While the specific pathway of SUSTech may not be easily duplicated in other universities, it can serve as a reference point, an inspiration, and a catalyst for fundamental and systemic reform and innovation in the broader higher education landscape. By sharing the implementation of general education at SUSTech, this case study makes an original contribution to the practice of general education, both among Chinese universities and globally. It serves as a stimulus for open discussions among researchers and practitioners in higher education

and promotes the exploration of innovative approaches to general education that meet the evolving needs of students and society.

In conclusion, this case study of SUSTech's general education system demonstrates the importance of an institution-wide approach, an innovation-centered perspective, and the integration of broad-based and individualized learning. Lessons learned from the SUSTech experience contribute to the broader discourse on general education and can inspire universities to transform their educational practices and prepare students to become innovative, self-directed thinkers capable of meeting the challenges of the future.

Author Contributions: Writing—original draft, X.L. and Y.L. All authors have read and agreed to the published version of the manuscript.

Funding: This paper was funded by the International Joint Research Project of Faculty of Education, Beijing Normal University (ICER201908) and the SUSTech Research Project of Southern University of Science and Technology (SUSTECH2020C005).

Institutional Review Board Statement: Ethical review and approval were waived for this study as we did not collect any information that could identify the participants during the data collection process. Therefore, according to the ethical review regulations, such research does not require ethical review.

Informed Consent Statement: Written informed consent has been obtained from the subjects involved in the study.

Data Availability Statement: The data that support the findings of this study will be made available from the authors upon reasonable request.

Conflicts of Interest: The authors declare no conflict of interest.

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