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Dialogue through Education- Learning between Europe and China

Publication of Submission

This project was run in collaboration between the Institute for Greater Europe and the European Guanxi. Both are youth led think tanks run by young academics and young professionals from all over Europe and beyond. Meanwhile, the Institute for Greater Europe puts a focus on the role of the European Idea on the European continent and beyond, European Guanxi searches to foster a mutual understanding between Europe and China. Together an essay competition was held from January to September 2023, which concluded with a symposium on the 23rd of September. During this project young students and young professionals from Europe and China were invited to submit their essays on the following topics:

- *How will exchange programs develop in the future?*
- *How can curiosity and enthusiasm for the other culture be awaken and strengthened?*
- *What potential does educational diplomacy have?*
- *What is the new approach to international and global education?*

The submissions of this unique academic project are collected in this publication, encompassing a wide range of authors from different interdisciplinary and intercultural backgrounds. During the symposium the ideas presented here were shared with a wider audience. The experience of this unique online event can be found on the last pages of this publication.

Partner Organizations

The **European Guanxi** is a youth-led think tank aiming for better mutual understanding of Europe and China. In the context of the *"polycrisis"* the sense of loss of identity and voice, or the Fourth Industrial Revolution, among others, it is imperative for the EU to readdress both its strategic objectives and its role in the world. Unity, consistency, and vision should guide the EU's engagement with China and more broadly, the international community. For further information please consult: https://www.europeanguanxi.com/

The **Institute for a Greater Europe** is a non-profit youth-led think tank based in Brussels, Belgium with members and interests all over Europe and Beyond. Founded in 2018, the Institute has members and writers from over 30 countries in Europe, North America, Middle East and North Africa, and Asia. The mission searches to generate challenging new ideas, bridge cultural divides and foster a community based around shared values across a wider European scale. For further information please consult: https://institutegreatereurope.com/

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Foreword by the Editors

An old Chinese saying states: 三人行，必有我师 (Sānrén xíng, bìyǒu wǒ shī) – In a group of three people, there will always be one person I can learn from." Education has always served as a bridgebuilder, opening new worldviews, and fostering a mutual understanding of different cultures. Simultaneously, education is always directed to the future, preserving what has been learned from the past, meanwhile equipping learners with the skills to realize the vision of a still uncertain future. Thus, with this project we dare a view into the future of global education.

The educational exchange between Europe and China is looking back onto a long history. Especially during the early 20th century many young Chinese students came to Europe for studying such as the famous Cai Yuanpai (蔡元培), who later became the founding father of modern pedagogy in China. Others who returned back from their studies abroad became iconic leaders, shaping the changes their society has underwent. Meanwhile in earlier times, China was considered as country of academic emigration, now it has turned into a country academic immigration likewise. Nowadays in reverse many young students from Europe are travelling to China to learn more about this country, culture, and its growing influence in global politics. During the last years, the educational and cultural exchange between the People's Republic of China and the European Union has gained new dynamics, such as the inauguration of the Confucius Institute, giving an interested audience in Europe access to the Chinese culture.

Nevertheless, new challenges of globalization and a knowledge-based society are shaping the corporation between Europe and China. Therefore, we encouraged young people, students, young researchers, and young professionals to share their experiences, their innovations, and their visions for the future of educational exchange between Europe and China. We are delighted that many followed our call contributing their ideas into this project. The topics discussed are very diverse, which were structured into three sections. The section: "New Ways for Linguistic" look upon motivation for and methods to learn foreign languages. The section "Mutual Learning between Europe and China" provides suggestion how different educational systems can provide inspiration for their counterparts to innovate. The section " Educational Diplomacy through intercultural exchange" looks upon potentials for improving intercultural encounters between Europe and China. Those essays are accompanied by insights into an academic project on introducing dual degree systems in China according to German experience. Furthermore this publications gives a look upon intercultural legal education. Eventually also a bridge between Brazil and China will be built, to sum up this intercultural academic reading experience.

We would like to thank all organizers, all participants, and all speakers for their tremendous contribution, which lead to the successful completion of this unique project. Especially we would like to thank our partners form European Guanxi for their support from the first draft to the final conference. Moreover, special thanks go to the Confucius Institute Freiburg, which gave inspiration for starting this project. Eventually the hard work and commitment of our assistants in Germany and China, name Zhou Yuchen, Liu Yuetong and Li Hongyan have to be mentioned. Their commitment was of high importance for the realization of this unique educational encounter between Europe and China. Hopefully, there will be another chance of working with you in a similar way. A solid fundament for future exchanges is set.

Concluding now we wish you dear readers an insightful lecture and wish you a great learning journey between Europe and China, between language, culture, and a vision for the future.

Best wishes,

Stephan Raab — **Head of the Organizing Team**

Associate Professor Dr. LI Jie (李洁) — **Co-Head of the Organizing Team**

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I. Perspectives from Researchers

Lessons learned? Research on the introduction of a German dual degree system in Chinese higher education

Dr. LI Jie[1] *Stephan Raab*[2]

Abstract

Education, especially higher education, stands as the embodiment for a society to prepare its young generation towards the future. Due to unprecedented technological innovations, probably many of nowadays generation of students will work in a job, that still does not exist today. Consequently, the classical division of subjects does not fit anymore, requiring an interdisciplinary thinking for the challenges of global digital times. Therefore, following the Bologna process, Germany has introduced a system of single degree dual major studies, combining different fields such as for instance digital humanities. This paper embarks on a concise comparative journey scrutinizing potentials of introducing a dual degree system in China, following the German example. Looking upon Chinese educational reforms, the implementation of new liberal arts at the Northwestern Polytechnical University will be discussed. Taking the technological revolution foremost artificial intelligence into mind, this paper argues for more interdisciplinary and transdisciplinary thinking in education to overcome epistemic boundaries and preparing students and research for an age of increasing complexity.

Keywords Dual Degree System, Germany, China, Comparative Analysis, Future Studies

Introduction

Every society is built on a certain degree of education, inheriting lessons learned from the past, meanwhile preparing the next generation for the future. In other words, societies are built through learning from their history through a process of change before and after lessons learned. However, despite this forward looking framework of education, the Italian sociologist and president of the Italian Associazione dei Futuristi Italiani (AFI), Roberto Poli bemoans about his scientific formation: " *There was no kind of forward-looking framework, no frame where to fit in the future"* (Poli, 2019, p.1). Such criticism has been reiterated by the Chinese educationist as first director of the renowned Beijing University: "Cai Yuanpai [蔡元培] considering his academic upbringing as *"wasted",* as Chinese education seemed reverted mostly to the past memorizing classical texts (Zhang, 1993, pp.147). Therefore, Cai Yuanpai emphasized his mission as: "*Educators are not for the past, nor for the present, but for the future*" (Zhang, 2020, p.359). Building on that, new ways of education are needed to prepare students for coping with the rising complexity of our societies. Consequently, several universities in Germany have introduced dual degrees, enabling to study and enrich their academic perspectives with combining two different subjects.

This paper will build on that issue, discussing the potentials of introducing dual degree systems in the Chinese university system. This discussion is structured as following. In the first part the Bologna process and the introduction of dual degree systems in Germany will be presented.

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After that the second part will show the practical implementation of this concepts into German higher education as well as presenting lessons learned. The third part will act as a connector, foremost describing the context of rising complexity. As every education is normative, embedded in a certain sociocultural context, here a general paradigm shifts in science through new scientific means will be examined. A critical understanding of the potentials and limits of this scientific innovations are essential for a suitable educational reform. Building on that the fourth part demands for thinking beyond the boundaries of one subject, explaining the differences between multidisciplinary, interdisciplinary, and transdisciplinary approaches. The fifth part will elaborate on the implementation of this system in Chinese higher education, taking the different sociohistorical trajectories into mind. Eventually, the six parts will give an outlook on the empirical results of the current educational reform in China. Eventually the last part will give an outlook on the importance of mutual learning for promoting educational diplomacy through encouraging an interdisciplinary as intercultural exchange of people and thoughts in global world.

1. The Bologna Process and the German High-Tech Strategy

Looking into the future of higher education within the European Union started at a historic spot. On the 19th of June 1999 the ministers of education from 29 countries gathered at the assumed oldest university in the world, at the University of Bologna, signing the "Bologna Declaration". Here the great importance of higher education in Europe is emphasized by the following words: "*A Europe of Knowledge is now widely recognized as an irreplaceable factor for social and human growth and as an indispensable component to consolidate and enrich the European citizenship, capable of giving its citizens the necessary competences to face the challenges of the new millennium, together with an awareness of shared values and belonging to a common social and cultural space.*"(European Ministers of Education 1999) This declaration started the "Bologna Process" searching to improve the comparability of educational systems upon the European continent. This reform came along the introduction of the Bachelor-Master System, replacing the previous diploma degrees. Prior to that reform, there were no interim degrees, only a "Vordiplom" with a "Grundstudium", acknowledging, that the students had acquired the basic skills and knowledge of the subject. After that students could specialize in their "Hauptstudium", eventually graduating with a diploma. Nevertheless, different then the Bachelor (seven to eight semesters) and Master (four to six semester) there was no restriction on semesters studied, theoretically studying undefined time. Based upon the European Credit Transfer System (ECTS), academic achievements between different European countries should be made comparable, building on a common system of measurement. Simultaneously, referring the Erasmus scheme, academic mobility should be encouraged, spending semester abroad (ibid.).

As a result, the mobility of students has increased tremendously. In comparison about 48.000 German students were inscribed at a university abroad in 1999. However, ten years after the commencement of this process, in 2009 already 115.000 German students had spent at least a semester abroad. Simultaneously the influx of foreign students had increased tremendously after the reform, reaching about 75.000 (Deutscher Bundestag, 2012, p.14.). A striking example of this reform are Erasmus Mundus Programs, where students spend each semester in another country.

The Bologna process began in the early days of what should become the digital revolution. In 2011 at the Hannover Messe CEBIT, one the biggest fairs for innovations in IT that time, the term industry 4.0. was presented to the public. Different than Industry 1.0 driven by the steam engine, Industry 2.0 driven by the conveyor belt and Industry 3.0. driven by automation, this new type of Industry 4.0 will be driven by the interconnection of humans and machines through the power of big data and artificial intelligence. After the fair a working group elaborated recommendations how to conceive a high-tech strategy for German economy. This report focused especially on six domains, foremost Industry 4.0, Smart Services, Smart Data, Cloud Computing, Digital Interconnectedness, Digital Science, Digital Education and Digital Living Spaces. (Deutscher Bundestag 2016). With the implementation of Germany's Industry 4.0

program, the German U15 university consortium [3] has gradually reformed from the characteristic of *"separate academic disciplines"* to implement interdisciplinary, integrated, and open teaching. It has taken interdisciplinary human resource training and interdisciplinary research as a feature of development in the context of the new era, and has opened up new cross-disciplines, dual degrees, and double professional degrees. Specifically, to draw on Germany's U15 University Consortium 's *"single degree with double majors"* academic system and tailor-make the university's *"single degree with double majors"* academic system for liberal arts, in order to promote academic disciplines and the development of the university's new liberal arts. It encourages preliminary cross-fertilization of disciplines, breaks down discipline and major barriers, and strives for in-depth integration of university liberal arts majors as well as embedded cross-fertilization with the university's peripheral majors of science, technology, agriculture, and medical science. The university's *"new liberal arts"* will be able to renew and revolutionize itself in the primary transition stage, with *"single degree with double majors"* as the main focus, supplemented by double degree training as the construction path.

2. Introducing dual-degree systems in German higher education

After having presented the trajectory of the Bologna process, this part will give an overview how those concepts were implemented in the German higher education. After that, lessons learned will be presented, which have to be taken into mind for the introduction in a Chinese context. Professor Bernd Eitel, President of the U15 Consortium and Chancellor of the University of Heidelberg, stated in his speech at the establishment of the Faculty of Engineering (2021) that *"through interdisciplinary dialogues, universities will facilitate the transfer of knowledge to society and contribute to breakthroughs in social change."* In the new era, the U15 consortium has made interdisciplinary talent training and interdisciplinary research the core of its philosophy and development characteristics, and it promotes interdisciplinarity and interdisciplinary development through three paths:

(1) **Establishment of a dual-major, single degree** (Zwei-Fächer-Studium): In contrast to the dual degree system, this is the system used by the vast majority of German universities in the humanities, languages, and social sciences, as well as a few science schools. At the undergraduate level, one must select at least two majors, namely a major (90-150 credits with a mandatory thesis) and a minor (30-90 credits without a thesis) and must complete a total of 180 credits for the major and minor, which is the same as for a single-major degree in general. However, the major and minor courses cannot be duplicated, and the credits are not interchangeable, i.e., duplicated courses in the course selection lists of the two majors will not be counted in only one of the major directions. After graduation, only one-degree certificate will be issued for the major direction, but the certificate will include the names of the major and minor, as well as the corresponding scores. For example, most humanities and social sciences programs at the University of Heidelberg require single-degree students to complete 75% of their major (Hauptfach) and 25% of their minor (Ergänzungsfach), or 50% of each of the two majors.

(2) **Doppelstudium**: Students are eligible for admission to two programs and enrol in two 180-credit degree programs (either concurrently or sequentially), which can be either a single or a double degree program, with credits transferred by the Prüfungsamt, the university's examination board, based on the similarities of the two programs. The total number of credits required ranges between 210 and 360ECTS, and students must complete two theses. Students receive a dual degree in both programs upon graduation. However, the duration of the dual studies is not doubled, and both degree programs must be completed within the time limit. For example, if the University of Leipzig allows

[3] **German U15 e.V.** is an association of fifteen major research-intensive and leading medical universities in Germany with a full disciplinary spectrum, excluding any defining engineering sciences.
For more information please consult: https://www.german-u15.de/

a maximum of nine semesters for Physics and nine semesters for History, then a dual degree student must complete both programs in nine semesters (Physics and History do not have the same courses, so there is no credit offsetting) to reach a total of 360 credits.

(3) **Setting up a new cross-discipline:** A cross-discipline is the intersection and fusion of two or more disciplines to gradually form a new discipline, which, as an independent speciality, also needs to reach the 180 credits required for a general single-specialty degree and complete a thesis, and after graduation, it can be awarded a degree certificate of the independent speciality. For example, the University of Trier in Germany has recently established the cross-discipline digital humanities, which primarily focuses on the digitization of articles with humanities content as the theme, such as labelling or networking, and more on. This discipline has been constantly developed and improved, and the university has prioritized the establishment of an independent faculty.

After that overview, the following will show the benefits and drawbacks of the three major cross-disciplinary and integration paths in German U15 colleges and universities, as well as the current state of development. With the increased demand for complex and innovative talents, German colleges and universities continue to establish "*emerging cross-disciplines*," but the development of a cross-discipline requires many years of comprehensive knowledge system construction and discipline setting experience, and the number of disciplines is often small. However, the development of a cross-discipline requires years of comprehensive knowledge system construction and discipline setting experience, and the number of disciplines offered, and number of students admitted for enrolment are frequently small, with demand exceeding supply. As a result, only a small number of students can pursue *"cross-discipline"* degrees at German universities; in other words, emerging cross-disciplines cannot meet the vast majority of students' specialisation integration demands in a timely manner. According to the 2022 report published by the Centre for Education and Academic Research of German Universities, the dual-degree system in German universities is gradually fading away, and only a small number of students choose to study dual degrees (of which dual degrees in economics, engineering, and sociology are more common), which is closely related to academic pressure in German universities. According to figures of the *"Study on Undergraduate Dropout Rates at Comprehensive Universities across Germany"* in 2022, the average dropout rate of undergraduates at comprehensive universities in Germany in the graduation year of 2020 was as high as 35%, implying that nearly one-third of undergraduates interrupted their studies, with mathematics and natural sciences having the highest dropout rate of 43%. The dropout rate in math and natural science is 51%, which is the highest, followed by the humanities (literature, history, linguistics, culture, etc.) with 50% dropout rate, which corresponds to an increase by 8% (Heublein et.al 2022, pp.5). However, here the difficult circumstances during Covid lockdowns have to be considered, probably worsening figures.

Besides those dropout rates students bemoan an increased level of disorientation. In 2000 there were about 450 bachelor and master programs, increasing to 13.000 until 2012 by either reforming previous or creating new ones from the scratch (Wissenschaftsrat 2012: 36f.). In 2021 this has increased to already close to 21.000 degrees (HRK 2021: 7). Due to that overwhelming choice often a comparability of study programs is hardly feasible, leaving students clueless. Moreover, students bemoan an increased level of pressure due to condensed curricula, often putting a four years' program into three years. Every module has to be concluded with an academic work, either a paper or exam. This comes along an increased feeling of stress and exhaustion among students. During the semester 2021 about half of students indicated a prolonged period of extensive stress burden, with 42% feeling over-exhausted by workload (BMBF 2023, p.40f.) Eventually due to the strict corset of the Bachelor- Master system a "Verschulung" (schoolification) is taking place, turning university into a prolonged school period. Especially the renowned German philosopher Julian Nida-Rümelin bemoans. the rigidity of the new system, shaped by obligation of presence ("Präsenzpflicht") as well as less leeway for creating a study program according to own interested. Consequently, a standstill in higher education is taking place. As a reaction Nida-Rümelin proclaims a reform, strengthening the

ideals of "Humboldtsche´s Bildungsideal" (Thurau 2008). This concept argues that education is does not only serve for increasing employability, but serving to create a fully fledged personality, being aware of its identity and position within the world (Niedermeyer 2020, p.226).

It can be seen that in German universities, particularly at elite institutions such as U15 and T9[4], it is already "difficult" to graduate with a single degree, and "difficult" to graduate with a double degree, with very few people able to complete the credits of a double degree, complete the thesis of both majors, and obtain two bachelor's degrees. Few students can complete the dual degree credits, complete the thesis of two majors, and obtain two bachelor's degree certificates. In light of the university's development, most German university students opt for a single-degree system of *"double major,"* which not only ensures the integration of multidisciplinary learning, cultivates, and exercises interdisciplinary thinking, but also avoids the double academic pressure and time conflict of a double degree. The *"double major"* single-degree system provides an effective and feasible path for the integration of disciplines in German universities, which is effective and promising, and is conducive to the cultivation of composite and innovative talents, as well as accumulating momentum for the implementation of Germany's *"Industry 4.0"* technological innovation strategy. Nevertheless, still more reforms and adaptions are highly recommended.

This argumentation has revealed the practical implementation of introducing a dual degree system in German higher education. As it could be shown that the technological revolution and political demands have spurred this process, leaving an ambivalent result. On the one hand student numbers have increased coming along a higher mobility for spending a semester abroad. On the other hand, this comes along an increase of complexity by an incalculable number of new degrees leaving students disoriented. Furthermore, the reform has revealed an increased feeling of pressure and exhaustion among students. As interim conclusion it can be argued that higher education and the university system have to be adapted to the demands of changing society. Nevertheless, there are certain lessons to be learned for improving this initiated process.

3. A call for complexity: Changing demands for education

Having presented the political context for educational reforms in Germany this part will serve as a connection between the European and the Chinese context. As every educational system is embedded in a certain sociocultural context, every education is normative oriented towards instilling certain values and norms on the learners. Obviously the European and the Chinese context are built on divergent sociocultural factors. Therefore, in the following a general understanding of the paradigm shift in science is delivered, considering scientific potentials and limitations of recent disruptions, adjusting the Chinese system after the German experiences.

Starting from the scratch first of all the evolutionary origins of the institution school, latter on university have to be reminded. For generations children had learned through socialization, imitating the behaviour of their parents as role models. However, with the invention of literacy, the art of reading and writing, this kind of learning presented itself soon as not feasible anymore. "*The institution classroom evolved at the moment, that the social complexity of a society had grown to such an extent, that learning through socialization and imitation did not appear functional anymore"* (Scheunpflug, 2001, p.61). In the classroom an accelerated evolutionary path of the society can be simulated, confronting students with situations, that might happen to them in real life, without waiting for the incident to occur (ibid. p.61). Therefore, classroom settings stand as depiction of the reduced complexity of a society, where students are members of that social construction (ibid.p.66). Often students and educationist argue that the current educational system does not provide sufficient training to provide them with the necessary skills to cope with a more complex society.

[4] **TU9 German Universities of Technology e. V.** is the alliance of nine leading Technical Universities in Germany. For more information please consult: https://www.tu9.de/

Keeping on following this path, scientific innovation evolved according to three different stages. Shortly after the Second World War in 1948 mathematician Warren Weaver developed a model of thought depicting history as the challenge to cope with and create within an environment of ever-increasing complexity. During the first age, having its beginnings at the origins of modern science in the age of enlightenment, there were *problems of simplicity*. Due to the limited computational powers as well as limited access to scientific tools scientist focused mostly on describing and observing, searching for figure out the potential variables. Such methods were mostly writing reports on observations during scientific journeys such as Humboldt and his magnum opus *"Der Kosmos"*. Scientist could conduct simple experiments, with low technology. Here, science could detect the connection between two variables such as heat, sound, or pressure, simply physics leading to common inventions such as the telephone or the radio.

After that, with the time of accelerated industrialization, at about 1900 the age of *disorganized complexity* emerged. Those days' scientists gained access to more sophisticated technology, including more knowledge about probability theories and statistics. This came along new methods in recording and calculating. This comes along the emergence of modern social sciences, taking the evolution subjects like psychology, sociology, and political science into mind. Thanks to those innovations more precise and reliable predictions about the future could be made. Nevertheless, this period is considered disorganized as various subjects such as social science, philosophy, and natural science or mathematic were considered separate domains.

However, entering the time of tremendous scientific progress since the 1950ies now we are facing the problems of *organized complexity*. Those problems, exceed computational capacities, often not possible to be translated and described into mathematical, quantitative figures. Therefore, a new combination of quantitative and qualitative access, thinking out of the boundaries of the own epistemic community is needed to discover the interrelationships between various factors influencing each other (Weaver, 1948, pp.536–544). Especially, with the times of ever more powerful artificial intelligence and ever more sophisticated algorithms and big data that kind of thinking is recommended, as artificial intelligence faces its limitations. This becomes obvious with the Theorem of Goedel and the Church-Turing-Hypothesis, arguing, that no mathematical system can prove its ultimate legitimacy and validity out of itself. According to those concepts a Turing-Machine or better known today as a simple computer; - human calculators were called computers previously; - could calculate not more than a human being. Every computation conducted by a machine like a computer, or an artificial intelligence could be performed by a human being yet requiring different time resources often limiting human power.

Put in other words, such as mankind is impaired to prove the existence of a higher existence, no algorithm based system can prove its own validity from within (Turing, 1938, p.8). Express by Turing: "*If each man had a definite set of rules of conduct by which he regulated his life he would be no better than a machine. But there are no such rules, so men cannot be machines"* (Turing, 1950, p.452). Consequently, despite the increasing potential of artificial intelligence and computational power, educating for human thinking is still highly required, as there is no universal algorithm of truth, however human beings can find a different more empathic creative approach to complex issues.

4. Crossing scientific boundaries [3] Multi, Inter, Transdisciplinary

Traditionally the world of social science, psychology and philosophy and the world of natural science, engineering and technology seem to be separated. Here, two separate themes of thinking seem to apply building on the famous statement by German pedagogist Wilhem Dilthey: "*Nature we search to explain, the mental mind we search to understand"* (Dilthey 1924, p.144). Explanation as a scientific paradigm relies on external research objects, to be observed and described with a defined number of variables. Through method, interconnections and intersections between those variables can be revealed. Conversely, understanding as a paradigm focusses on the complex inner mental workings of a human constructivist word, requiring having glimpse about the

context in which and in which between research is conducted. Meanwhile explanations require the knowledge of rules and mechanisms, understanding requires a consciousness about contexts and an empathic feeling (Beinke 2016,pp.101). Bringing both worlds together demands for high bridge-building skills, where in the next part. the case study of Northwestern Polytechnical University (NWPU) will serve as an example of such approach in a Chinese context

In classical term science at universities is structed in departments and institutions. Accordingly science can be conceived as a form of institutionalized knowledge, independently of its researchers (Böhme, 1994, p.67). Here, the findings of many generations of scientist are compiled, giving research access to experiences they have never made in their life. Organized on a basic theoretical fundament along institutions and scientific specialists, modern science stands for the *"socialized research"* (ibid.pp.72). Scientific knowledge is inclusive as everybody disposing the required skills and applied methods can prove the findings either right or wrong (Treml, 2010, p.89). Nevertheless, each department such as social sciences vs. natural science belong to a certain epistemic community, sharing an intersubjective understandings, having a shared way of knowing (Haas, 1992, p.3). In other words, they set the definition and standards what according to their membership has to be considered scientific. Due to their *epistemic practical authority* they define the selection criteria how to get from complexity to what is considered scientific knowledge (Adler, 2019, p.10). However, as no science can claim anymore, to be in possession of full explanatory power new ways of scientific corporations are needed. Nowadays, the boundaries of the disciplines, emerged in the pursuit of ordering the modern world, seem to blur. New sorts of mixed disciplines and subdisciplines are surfacing, revealing the epistemic boundaries of each perspective (Giri, 2002, p.104). New cross-disciplinary approaches, combining at least two different subjects, are required. Here, three popular approaches, multi-, inter-, and transdisciplinary access to scientific knowledge will be presented with their potentials.

Multidisciplinary: More than two subjects, such as for instance joint research between IT and psychology are involved. Research takes place within the own discipline. The research work independently on their research question. Here, the members of the team have separate but interrelated roles. At the end, the findings are put in juxtaposition, however the epistemic boundaries of each discipline are maintained, IT might be curious about the efficiency of the code, meanwhile psychology would focus on the effects of the program on the mind. Consequently, the fruitful knowledge transfer into other disciplines is rather limited.

Interdisciplinary: Likewise, at least more than two disciplines are involved. Research takes place between the disciplines. Differently, here the members work jointly on certain research questions. The members of the research team have common roles. Eventually the epistemic boundaries between the disciplines are permeable to a certain aspect, however scientist still maintain their epistemic socialization, such as taken the example improving the user interface. Consequently, working on joint questions and shared goals a transfer of knowledge and innovation is taking place. Here, an interactive, integrative, and collaborative approach is used.

Transdisciplinary: As previously more than two disciplines are involved. Research takes place across and beyond scientific boundaries. Here, many actors like scientist from relevant disciplines, stakeholders or affected non-academics are involved. Those share a conceptual framework, searching for an integration, assimilation, incorporation, and harmonization of the various disciplines. Researchers work in the mode of role release, acting out of the role, as well as role expansion, expanding the roles functions. Eventually, due to bringing so many perspectives into the research, the knowledge gain is tremendous. Nevertheless, creating a shared conceptual framework is everything apart from easy (Lawrence, 2010). An example could be found in urban development involving architects, sociologist, politicians, and citizens on an equal level.

5. The dual degree system for Chinese Higher Education

5.1 Education Reform in Chinese Higher Education

The previous part has presented several arguments for the urgency of interdisciplinary thinking. Using the keyword *"Zwei-Fächer-Studium"* in Google Scholar, 2590 articles can be found, and the number of German and foreign scholars who have researched the dual-professional single-degree system has been growing exponentially in recent years. Conversely, a search for the keyword *"double major degree"* in the China National Knowledge Infrastructure (CNKI) database yielded no relevant academic literature. This demonstrates that, despite being a hot effect in foreign teaching practice and research, the experience of the German double major single degree system has yet to capture the attention of the domestic academic circle, particularly the education circle.

Since the dawn of the knowledge economy 2.0, where economic development is highly dependent knowledge intensive activities like research, the information structure, cognitive structure, and social structure have all changed dramatically. In response to the *"great change that has not occurred in a hundred years",* China has implemented educational reforms and encouraged the innovative development of academic discipline construction, and the characteristics of China's colleges and universities have gradually shifted to the fusion of disciplines and inter-disciplinary fusion. Xue Qikun, a representative of Chinese Academy of Sciences, stated: "*Driven by the country's major strategic needs, cross-disciplinary convergence of multiple disciplines and cross-border integration of multiple technologies will become the norm, and the development of cross-disciplines in the world's first-class universities is also a general trend* [在国家重大战略需求的驱动下，多学科交叉汇聚与多技术跨界融合将成为常态，世界一流大学发展交叉学科也是大势所趋]．"[5] The Ministry of Education, the Ministry of Science and Technology, and 13 other departments in 2019 announced launch the "six", "one outstanding" program together The same year the Ministry of Education, the Ministry of Science and Technology, and 13 other departments jointly launched the "*six excellence and one top* [六卓越一拔尖]" plan 2.0, and the construction of the *"four new"* disciplines ["四新"学科] (new engineering, new medical science, new science, and new liberal arts) has begun. During the last decade the Peoples Republic of China has developed into a hub for disruptive technologies in the field of artificial intelligence and digitization. The rapid development of the Internet, artificial intelligence, and other high-tech has gradually transformed the basic disciplines of liberal arts, such as literature, history, philosophy, and so on, into instrumental, and the shortcomings of *"separate disciplines"* have severely hampered the development of liberal arts. The construction of *"New Liberal Arts"* is a reflection and improvement of previous education, aiming to break down barriers between disciplines and move towards *"inter-disciplinary integration",* and even some new cross-disciplinary liberal arts categories, such as Tsinghua University's establishment of a *"full-time LLM (Master of Laws) in Computational Law[计算法学全日制法律硕士]"* program in 2018.

According to the 2020 *"Declaration on the Construction of New Liberal Arts* [新文科建设宣言]", it is necessary to achieve not only interdisciplinary and multidisciplinary development, but also recognition of the importance of interdisciplinary and multidisciplinary development, as well as cross-disciplinary education development. cross-pollination and development, but also to emphasize the nature of the liberal arts and the importance of the liberal arts themselves in the construction of the new liberal arts. Referring back to Germany a new field of digital humanities combines humanities and IT-technology. Those kinds of mixed degrees could provide an inspiration for the promotion of interdisciplinary and transdisciplinary thinking already among potential future researchers, searching to make an impact on shaping a technology intense future.

[5] see: 以"实"为要 推动交叉科研高质量发展 (Taking "practical" as the priority to promote high-quality development of cross-disciplinary scientific research) in: In China News 05.05.2022; http://www.ln.chinanews.com.cn/news/2022/0505/322603.html

5.2 Construction of New Liberal Arts at Technical Universities

Northwestern Polytechnical University (NWPU) is the only first-class university in China featuring aviation, aerospace and maritime engineering education and research, and it has many national key disciplines and ace majors, which creates very convenient conditions for the introduction of the *"single degree with double majors"* path in liberal arts in NWPU. Unlike traditional pure liberal arts or pure science and technology institutions, NWPU can integrate the resources of various majors in liberal arts and promote the in-depth integration of humanities and social sciences disciplines in NWPU, and also give full play to the advantages of other majors in NWPU such as the three aviation and kinetic energy disciplines, so as to facilitate the peripheral embeddedness of the advantageous military-industrial disciplines for the construction of new liberal arts in NWPU. The peripheral embedding of the new liberal arts.

While actively responding to the construction and development of *"new engineering*" and *"new science"* as a world-class engineering university, Northwestern Polytechnical University (NWPU) has also actively promoted the construction of *"new liberal arts"*. For example, Northwestern Polytechnical University issued the *"14th Five-Year Plan of Liberal Arts Construction and Development* [文科建设发展 "十四五" 规划]" in December 2021, accelerating the construction and development of liberal arts in the university and giving full play to the value-led and quality-improving roles of liberal arts in talent cultivation. In 2021, the Ministry of Education approved four NWPU projects as research and practice projects in new liberal arts, and Shaanxi Province approved four projects as research and practice projects in new liberal arts. From preliminary research it can be seen on the development status of liberal arts at this university that the construction of new liberal arts at this university is still in the early transition stage, and there is still a long way to the later transformation stage, and the construction of new liberal arts in our university, if education reform blindly goes over the *"cross-discipline"* and directly enter into the *"cross-discipline",* it is very likely that it will have a negative impact on it. The reasons are as follows:

1) Before the opening of the new liberal arts cross-disciplines, it is necessary to complete the discipline's knowledge system, accumulate and form a systematic theoretical foundation, keeping in mind that any new disciplines are based on the framework of perfect theoretical knowledge.
2) The new liberal arts cross-disciplines must be precipitated by time, and they must be gradually shifted from the discipline cross-discipline. The training program and degree system should be constantly improved, and it is critical not to swallow the whole thing and ignore time precipitation and experience accumulation.

This research is based on the characteristics of the development of liberal arts majors and real problems in Northwestern Polytechnical University (NWPU), with the goal of creating a "*single degree with double majors"* for the new liberal arts in the university's primary transition stage, in order to truly *"break the problem"* and put the construction of new liberal arts in our university into practice. NWPU 's path to new liberal arts construction can be divided into two major stages: the initial transition stage and the later transformation stage. Thus, it is believed that the construction of new liberal arts at NWPU is still in the early stages, and the direct large-scale establishment of new cross-language liberal arts is very likely to have the negative effect of *"pulling up the seedling to help the child grow up"*. In light of the current situation and actual problems of the university's liberal arts construction, specific and feasible corrective measures are proposed for the cultivation mode suitable for the primary transitional stage of the university's new liberal arts construction. This approach is visualized in figure 1 representing the various research steps.

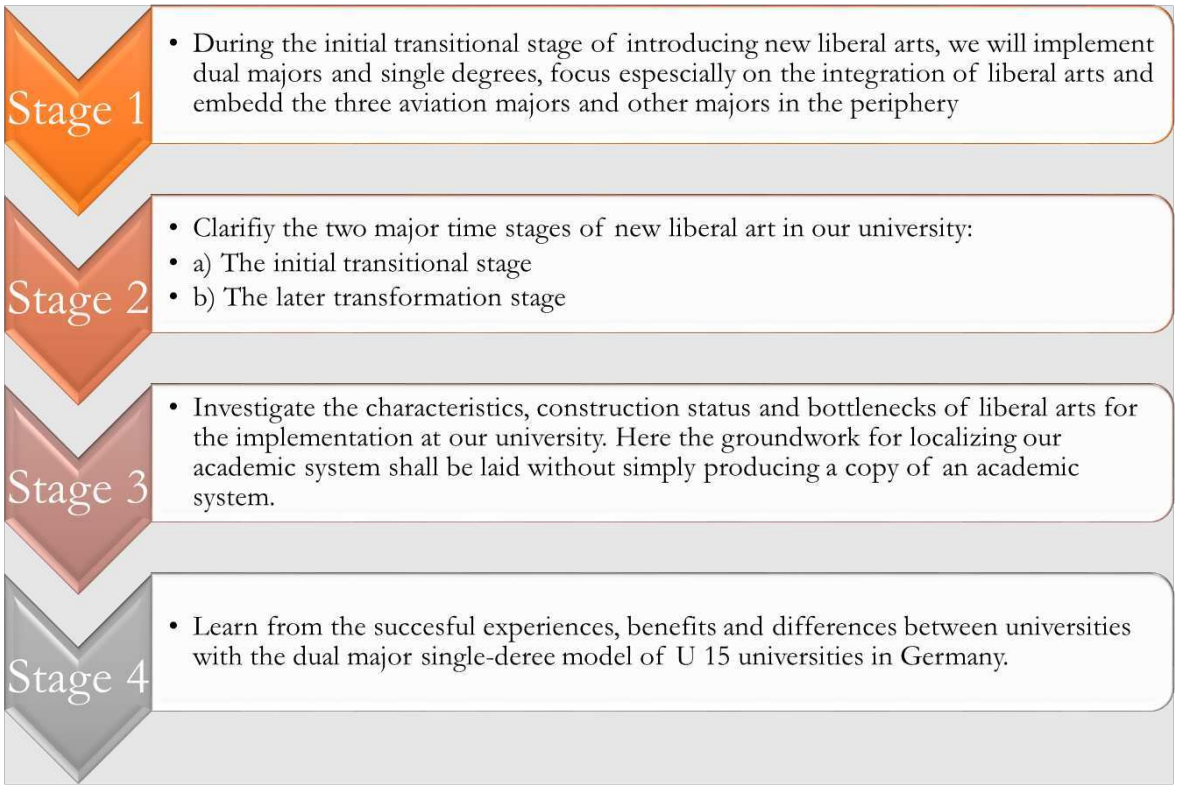

Image 1 Description of the various steps of the research puzzle

Through the preliminary research on the development status of liberal arts at NWPU, it becomes obvious that the construction of new liberal arts there is still in the early transition stage, and there is still a distance from the later transformation stage, which needs to be shifted from *"cross-discipline"* to *"cross-discipline"* step by step in an orderly manner. The establishment of new cross-disciplinary majors is the long-term strategic goal for the construction of *"new liberal arts*", while the dual-degree system can only be an auxiliary strategy in the initial and long-term stages because of its low coverage and greater constraints. Therefore, *"single degree with double majors"* is a feasible solution for the construction of *"new liberal arts"* at NWPU in the initial transition stage.

The aim of this research proposal is to provide a solution for the initial transition phase of the new liberal arts program at the university. Under this basic framework, the study adopts a two-step strategy: firstly, on the one hand we have to discover our source of inspiration stemming from the German reform of the higher education system, i.e., we have to explore the *"double major single degree"* model of the German U15 University Consortium in the construction of liberal arts; on the other hand, we have to *"know ourselves"*, i.e., we have to comprehensively investigate the strengths, weaknesses and characteristics of the development of liberal arts at the NWPU. A simple German Chinese transfer is not recommended as both educational systems are established on a different academic tradition and cultural fundaments. Moreover, we need to *"know ourselves"*, to accurately grasp the existing problems and bottlenecks in the construction of new liberal arts in our university, and we need to know that the construction of new liberal arts, as Mr. Zhang Bolin said, should be "*based on the academic background of Chinese history and society, and take solving the problems of China as the goal of education* [以中国历史、中国社会为学术背景, 以解决中国问题为教育目标]"[6]. Then, two major time processes for the construction of new liberal arts in our university are put forward, and make it clear that the construction of new liberal arts in our university is still in the primary stage, and we should learn from the successful method of integration of disciplines in Germany's U15 University, integrate the advantages of liberal arts, military industry and three aviation majors of Northwestern Polytechnical University, and implement the localized *"double majors and single degree"* system suitable for our university, and

[6] 以中国历史、中国社会为学术背景，以解决中国问题为教育目标 (Taking Chinese history and Chinese society as the academic background and solving Chinese problems as the educational goal): in: Baidu 07.08.2018:"燃志之师"张伯苓："中国不亡吾辈在!"③ (baidu.com)

encourage our university to implement the *"double majors and single degree"* system, and to encourage our university to develop a "single degree" system. The system of *"single degree with double majors"* should be implemented to encourage the in-depth integration of humanities and social sciences disciplines in NWPU as well as the mutual embedding of military-industrial majors, so as to break through the mindset of *"small liberal arts"* and build a pattern of *"big liberal arts"*.

5.3 The "Bottleneck" in the Construction of New Liberal Arts

As the previous chapter has shown, many initiatives are surfacing to learn from the German dual degree system, employing these experiences as a source of inspiration. Those ambitions are accompanied by many efforts which are still in their infancy, searching to unfold their potential. As the case study has shown Northwestern Polytechnical University (NWPU) has been actively responding to the development of *"new engineering"* and *"new science",* while also promoting the development of *"new liberal arts"*. At the moment, NWPU's construction of new liberal arts is still in the early transition stage, and there is a long way to the later transformation stage, so it is critical not to go over the *"cross-discipline"* and directly enter the *"cross-discipline*". However, several *"bottlenecks"* are associated with this reform of higher education.

The Humanities Department of U15 University in Germany adopted the *"single degree with double majors"* model, which can provide a *"breakthrough"* method for the construction of new liberal arts in our university, as a good reference for solving the primary stage of the construction of new liberal arts in our university. To assist the university in promoting this academic system, a thorough understanding of the current system and the development of liberal arts at the university is required. Therefore, this research applies a focus on researching our university's current degree system, training programs, curriculum, and degree requirements for liberal arts majors, while also interviewing our liberal arts students about their acceptance of and expectations for *"single degree with double majors"* via questionnaires. A localized model of *"single degree with double majors"* will be proposed for the construction of new liberal arts in the university after fully understanding the current development of liberal arts in the university and the needs of teachers and students. What is important to keep in mind, that is foremost taking the socio-scientific background of the Chinese university context into mind.

Foremost the promotion of inter- and transdisciplinary thinking has to be translated into practical research and education of potential future researchers. Therefore, besides providing the financial and logistical resources, foremost an openness to new ways of mental models is needed. Currently, the epistemic boundaries between the disciplines are blurring. Keeping in mind, that those boundaries are the result of the scientific spirits of the age of enlightenment searching to reflect a clear ordered world in the scientific classification of subject. However, with borders blurring, becoming more permeable a different kind of thinking is required. A modern disciplinary thinking fails short to realize that their claim for universality is void, acknowledging the "*significance of other disciplines in gaining multiple perspectives about the world to which both one's as well as another's discipline contribute"* (Giri, 2002, p.106). Consequently, introducing a dual degree is foremost dependent on the willingness for dialogue and "*authentic embeddedness",* becoming aware of one's subject in the universal complexity of the scientific world as well admitting the own epistemic limitations. This comes along the openness for including other disciplines and their epistemic access on the issue (ibid. p.108). Summarizing introducing such dual degree reform has to be conceived in collaboration with scientist, students, and educators, opening opportunities for all to shape this learning process.

5.4 Lessons learned on the way from Bologna to Xi·an

Summarizing this comparative section, it could be shown, that the Chinese educational reform find high potentials in the introduction of new liberal arts through dual degree systems. Here, the experiences made in the German context can provide a fruitful inspiration for the implementation process. Nevertheless, as this research has shown, this transition has come with several side effects, which have to be taken into consideration for a smooth educational reform. Consequently, this part will give some practical recommendations out of the lessons learned from the Bologna process.

Transition Phase: As this research has shown, reforming an established education system into a new structure often comes along a bumpy transition phase. Therefore, learning from the German example, for the Chinese context it is recommended to start thinking about interdisciplinary corporations. Those come in the form of combining subjects, like social science and natural science within the own university, but likewise widening the network. In the case of the Northwestern Polytechnical University this could be a corporation with the Northwest University of Political Science and Law, both located in Xi'an, could combine the subjects of aviation, aerospace, engineering with the lessons about political and social sciences. Moreover, a better mutual learning on the international level could be aspired, promoting corporation with universities abroad. This could come along setting up international offices as representation in the foreign country. Taking the NWPU as an example, such an office was set up in Kazakhstan most recently[7].

Comparability: A central goal of the Bologna process was to make studies more comparable. Simultaneously this has to be taken into mind for the Chinese context. Therefore, such an educational reform, creating new interdisciplinary subjects and dual degrees should be based on common indicators, taking several factors into consideration. A core factors should be the better ingraining between education and economy, jointly defining the skills needed for the future job market. Moreover, experiences from different universities and students, having graduated there, should be taken into consideration. At the same time new methods should be considered, promoting a stead exchange of lecturers. Eventually, a research on students after graduation helps to figure out, what long term career prospectives are associated with the new degree.

Workload: As shown with the statistics an increase of workload negatively affects students and their well-being during their studies. Therefore, learning from the German experience, it is advisable to firstly widen the scholarship system, that students do not face the double burden of workload pressure from university and making their living. Moreover, more mental health aspects should be integrated into the daily life at the campus, establishing offices, where students can approach with their mental issues in a confidential way. Eventually, a better integration of practical times, like doing an internship could be helpful, to acquire a real-life experience on the future job.

Orientation: As a result of the Bologna reform process the amount of degrees has been mushrooming. Therefore, students often lack a clear orientation, as to spot the differences between the degrees. Consequently, a comprehensive advising of the students is needed. This might start by giving tours for prospective students, learning about the campus and daily life at the university. Moreover, lecturers could be assigned, where students will direct to when considering changing their subject. Moreover for increasing flexibility studying according to the own interests, a smoother transition between two study programs should be enabled, where missing courses can be caught up, while considering previous academic achievements for the final degree. This comes along opening opportunities for a gap year, as well as allowing potential

[7] Kazakhstan Branch Campus of NPU officially opens; in: China Daily 16.10.2023; available at: http://education.chinadaily.com.cn/2023-10/16/c_930768.htm

future employers such as tech enterprises as in the case of Xi'an to set up an career offices, where students can directly apply for internships. Moreover, career centers providing training for the application process could be a fruitful addition, helping students to gain first-hand experiences on their future aspirations.

Outlook: As it could be shown, the scientific world is changing according to the new demands of societies undergoing disruptive changes. Therefore, new ways of educating and preparing students are highly needed. Giving an short outlook, new ways of thinking out of classroom are required, overcoming the boundaries of certain subjects, creating new interdisciplinary degrees. Furthermore, it should become more easy to gain knowledge from a different field, such as an engineering students attend lectures on philosophy or a philosophy student attending courses on statistics. Eventually, universities should think comprehensively, including their lectures and students, updating their methods through regular polls. Consequently, universities are leaning hubs, that have to keep putting themselves into question for energizing a steady learning process.

6. Synthesis of German and Chinese Higher Education Reform

As shown in the introduction education always contains a certain aspect of futuristic thinking. Every type of learning is about anticipating the future, preparing, and enabling change and progress. Through this process students shall discover their full potential and develop their personality (Nolda, 2015, pp.20–32). Nevertheless, with the future having become ever harder to predict, a purely goal-oriented, teleological conception of education does not seem to fit any longer. According to Poli nobody can predict what skills will be needed (Poli, 2019, p.124). The complexity of our modern life has become as high, that simply answers are hard to be found. Therefore, a form of "*Kontextsteuerung"* is required, with classrooms setting a certain environment, trying to influence the context, corresponding to the age of organized complexity, as direct linear interventions, corresponding to gone days of simplicity, now seem to be futile (Wilke, 2020, p.20). Consequently, more than teaching facts and figures, a mindset has to be taught for students to be able for acquiring new skills or in the words of Poli: "*As far as these skills are concerned, it is necessary to develop independent personalities who stand on both feet, believe in themselves and their ideas, and are able to understand their own environment and be able to take care of themselves*" (Poli, 2019, p.124). Learning stands for acquiring as training methods for dealing with the uncertain (Scheunpflug, 2001, p.64).

Drawing a synthesis from the previous chapters, it has to be reminded that technology is never neutral. The French sociologist Bruno Latour developed a model of *"actor-network theory"* revealing, that even non-human actors like machines or algorithm can become an actor, affecting our behavior and the way we think and act (Latour 1987). A striking example is given by his Italian counterpart Massimo Airoldi. In his research *"Machine Habitus: Toward a Sociology of Algorithms"*, the author combines theoretical fundaments of sociology with the increasing cognitive power of artificial intelligence (Airoldi 2021). Consequently, any kind of technology is always embedded in the cultural context of its human users. This can be emphasized by the Chinese concept of ti-yong[体用］Established during the late period of the Qin-Dynasty, Chinese intellectuals and reformers were seeing the West through the lenses of admiration and aspiration for modernization but also with suspicion losing the Chinese identity. The concept of ti-yong[体用], which represents a balance between the essence of (Chinese) learning (ti) and (western) practical use (yong) (Kalman, 2018, p.157). Both ti-yong are interdependent on each other (Pohl, 2018, p.57). This can be summarized by Chinese architect pioneer Lin Huiyin[林徽因]:" *We must learn the fundamental principles of all art only in order to apply them to designs distinctly ours*." (Elegant, 2019, p.52). Therefore, combining the potentials of engineering and technology with creativity of liberal arts provides huge potential.

To build a new liberal arts development path, we must "*not forget the original, absorb the foreign, and face the future*", and learn from the excellent results and theories of liberal arts construction in German U15 universities. We must also keep in mind the current situation of Chinese university