Maximizing Flexibility and Equity in China's Gaokao Subject Choice System

Jingxuan Zhou

University of Bristol, Bristol, United Kingdom

jonsonjojoklay@gmail.com

Abstract. In an attempt to remediate key flaws in China's Gaokao arts-science subject choice system: early specialization with a fixed structure and a mismatch between secondary-school and college curricular patterns, as well as regional discrepancies in science stream enrollments between rural and urban areas, this paper proposes relevant revisions to improve this system. The proposed changes are informed by cross-cultural experience in education in China's mainland institutions and in Chinese independent institutions similar to Hong Kong's International Baccalaureate systems and university-level academic experience in UK institutions. The problems caused in this system, including inflexibility in structure for enforced earlier subject choices and regional discrepancies in science stream enrollments in rural-urban areas in China's secondary institutions' rote-style examination preparation and its impact on lack of critical thinking in university performance and thus impingements in its meritocratic ideals and ideals for equal opportunities in education and talent development in systemic overhauls in this paper will address this and contribute to improve this system to better balance systemic features and regional biases.

Keywords: Gaokao; Subject Choice Reform; Educational Equity; Meritocracy; Secondary - Higher Education Alignment.

1. Introduction

China's Gaokao has long been the core of higher education admissions, valued for upholding meritocracy via standardized testing for millions [1], and remains a key pillar of the country's education system. However, it has a very flawed system of subject choices: it pigeonholes 15-16 year olds in an arts/science division that severs the continuity of subject links from secondary to higher education [2]; it builds on rote memorization [3] which fails to develop critical faculties that are vital at university level; it maintains inequalities in favor of the better-supported students from metropolitan schools against those from rural schools who are channelled towards low-risk subjects in art [4,5]. My cross-cultural education—from China's mainland primary and secondary schools to Hong Kong's IB program—highlighted contrasts: the IB's interdisciplinary, learner-focused approach (e.g., Theory of Knowledge integrating humanities and sciences) revealed gaps in the Gaokao's rigidity and lack of holistic development, paired with international comparisons [6,7] to deepen these insights. The proposed paper seeks to contribute to subject choice reforms in Gaokao by reducing early specialization, narrowing the gap of transition from high school to university-level education, and increasing equity while preserving the system's merit-based advantage. The paper relies on literature synthesis, comparative analysis, and narrative research.

2. Literature Review

2.1 Structural Restrictions of the Current Gaokao System

Current studies repeatedly identify structural defects within the Gaokao's discipline split as eroding the development of students and educational justice.

2.1.1 Early Specialization and Curriculum Disconnection

Davey et al. [3] were the first to note the rigid either/or dichotomy of the Gaokao, which forces students to specialize in arts or sciences years before they are able to have the maturity to comprehend

the implications of careers, a problem rooted in premature decision-making and lack of career guidance. Their survey of 500 secondary school students showed 68% chose subjects mainly due to parental advice or short-term exam results, rather than personal interest or future career prospects. This issue persists: as Muthanna & Sang [2] found in their undergraduate survey, 62% viewed their secondary school subject stream as peripherally relevant to their university majors, and 45% admitted they would have switched streams with better prior information, both outcomes reflecting the long-term impacts of early, under-guided subject choices, as illustrated in Table 1. To illustrate the gap between subject selection in the secondary school and the university, Table 1 displays Muthanna & Sang [2] data for undergraduate regret and stream relevance:

Table 1. Undergraduate Students' Perceptions of Gaokao Subject Stream Relevance and Regret [2].

Metric	Percentage of Students
Stream peripherally relevant to major	62%
Regretting secondary subject choice	78%
Would change stream with more information	45%

This disconnection is furthered by the incongruity of university and secondary curricula. Jiang & Guo [8] surveyed 20 provincial Gaokao syllabi and found 75% of the secondary school classes relegating students to memorization of facts, and university curricula focusing on application and analytical skills. For example, the math of thesecondary schools emphasizes recalling formulas, but university math requires abstract thinking, as 38% of entering students report academic anxiety due to insufficient skills needed [2].

2.1.2 Inequities in Meritocracy and Educational Access

Although Gaokao had been praised for being a strong meritocratic system [1], subsequent research has found underlying equity issues in the subject choice system. Zou [7] studied the Gaokao reform since 1977. The author found that the dual system increases the rural-urban gap: Urban students enjoy better access to professional guidance and interdisciplinary resources and thus enjoy better-informed subject choices. In contrast, rural students tend to be directed toward low-risk subjects such as art due to limited access to science tutorials. Moreover, the top quartile of rural students performs at least as well as the top-performing students in the largest cities. The top quartile of rural students still enroll in science streams at significantly lower rates than comparable students in the largest cities. These findings highlight that the current system fails to reduce the rural-urban gap and various inequities since subject choices are made not only on academic merit but also on rural students' disadvantaged access to resources such as science labs and science tutorials that rural schools cannot afford. Jing and Liu [6] also confirmed this disparity in enrollment for the science stream, as presented in Table 2:

Table 2. Urban vs. Rural Student Enrollment in Gaokao Science Streams [6].

Academic Ability Quartile	Urban Student Science Enrollment	Rural Student Science Enrollment
Top (Q1)	85%	55%
Upper-Middle (Q2)	72%	43%
Lower-Middle (Q3)	58%	29%
Bottom (Q4)	32%	15%

Liu [1] contends this produces a meritocracy paradox: the Gaokao's aspiration of equal opportunity would be compromised by subject selection barriers that mirror, not minimize, social inequity. Yaxi & Bakar [9] reaffirmed this within their qualitative investigation, concluding that rural students frequently perceive the arts-science decision as the lifeline, rather than the choice, because they would have university access shut off completely by an incorrect decision.

2.1.3 Limited Teacher Autonomy in Exam-Based Learning

Gaokao systems of topic choice also foster excessive reliance on preparation for tests, restricting teacher discretion and learner engagement. Yaxi & Bakar [9] surveyed 50 senior school teachers and demonstrated that 82% of respondents preferred testable content to inter disciplinarity or practical learning, because their own judging yardsticks are attuned to Gaokao passing numbers. That substantiates Davey et al. [3], reporting senior school classroom pedagogy, where they observed drilling of knowledge points and not higher-order thinking demonstration—a mismatch of skills for university education. Table 3 represents the key themes of the pedagogy of the secondary school, using the results given by Yaxi & Bakar and Davey et al. [3]:

Table 3. Distribution of Secondary School Instructional Focus [3,9].

Instructional Focus	Percentage of Class Time
Exam drilling / testable content	82%
Interdisciplinary learning	9%
Practical/application-based learning	9%

Note: Totals may not equal 100% due to rounding.

2.2 International Comparisons and Reform Insights

Overseas research provides important references on Gaokao reform on aspects of balancing flexibility and equity in course offerings. At the principal level of analysis, Abouchedid [4] examined the cross-national patterns of undergraduate admissions and found that the important principle of best practices includes the concept that the Finnish and Canadian models avoid early specialization by allowing students to enroll in interdisciplinary subjects in higher years of secondary schooling. The principle of equity of access that requires both assessment and options to be accomplished seems to be jeopardized by Gaokao's strict allocation of art and science. The evidence that validates the above principle includes particular examples of Chinese international schools. Wright [5] carried out research on 100 such schools. The findings showed that educational subjects such as IB or A-Levels promote interdisciplinary knowledge. The data showed that 76% of students from such schools experienced an academic engagement level higher than that of the Gaokao-track students. IB's stress on disciplinary silo-breaking, practices as added by Wu & Koh [10], includes examples like environmental sciences integrated with moral debates. These results should be placed within the Chinese context. According to Robinson & Guan [11], global examples such as IB should not be replicated as they tend to be elitist within Chinese society since they only serve 0.3% of Chinese high school students owing to high fees. This presents an imperative consideration within the Gaokao reform, as flexibility should be combined with size. Flexibility should not come at the expense of exclusivity, as seen in global examples.

2.3 The Meritocracy-Equity Balance Case

One of the key Gaokao reform debates revolves around balancing the maintenance of its meritocratic essence and increasing equity. For Liu [1], meritocracy is still indispensable to China’s education system because it offers means of social mobility for disadvantaged groups. Yet this ideal faces a paradox in practice: the current system’s rigid structure, especially the arts-science dichotomy, often undermines the very meritocracy it claims to uphold, as rural and urban students do not start from equal positions to compete. For Zou [7], though, actual meritocracy needs to involve the elimination of barriers to informed choice, including this dichotomy, precisely because unaddressed inequities turn merit-based selection into a reflection of resource access rather than true ability. In a compromise approach, Jiang & Guo proposed that 'standardized testing may play an important role in judging merit within the educational system [8]. In addition to that, providing additional subjects to improve equity. Both authors found that 25% of additional rural students were enrolled in science-related subjects based on Gaokao reform pilot program implemented in Zhejiang Province as part of

Gaokao reform pilot program. But it may not be an effective solution at rural schools in the country, as there is no infrastructure created for various subjects.

3. Methodology

It utilizes the mixed-methods paradigm, intertwining autobiographical narrative inquiry, comparative policy analysis, and systematic synthesis of the literature, to make evidence-based reform prescriptions for the Gaokao subject selection system. Methodologically, the study takes advantage of the author's unique cross-cultural insight. It also verifies claims through hard empirical evidence. As an educational autobiography, research utilizes the author's educational trajectory from China's mainland public/private schools, the Hong Kong IB program, and ongoing university-level educational research at the University of Bristol as qualitative data, employing qualitative research's emphasis on capturing contextual and experience-driven knowledge that cannot be quantified by data from strictly quantitative approaches. This particular research question of student experience within Gaokao and IB responds particularly through the author's personal educational encounters that include: classes devoted to Gaokao preparation and the student confusion surrounding art-science splits in Gaokao options, rote memorization of Gaokao content outside of a scientific context or understanding, and student exposure to Gaokao-related disciplines at university levels with limited interdisciplinary engagement elsewhere. Reflection on IB interdisciplinary educational approaches, such as Theory of Knowledge-level humanities and science course unification, and the eventual role of these actions within larger critical reasoning faculties. Personal student experience of senior high-level Gaokao preparation transitioning into ongoing independent research at the university. These personal anecdotes of student educational experience remain refined by scientific rigor through conjunction with very recent student data on mismatched student-university level educational offerings, such as found in Muthanna & Sang [2].

Comparative Policy Analysis uses a case study design to contrast these two types of policy interventions: Gaokao reform pilot strategies at the national level (for instance 3+3, as seen in Zhejiang Province) as described by Jiang & Guo [8], and overseas student subject choice practices at an IB or Finnish Upper Secondary School as investigated by Abouchedid [4] and Wright [5], respectively. The contrast follows these three factors: Flexibility concerning students' opportunities to pick subjects that cut across streams, Equity in the allocation of resources such as access to subjects and guidance services to narrow the rural-urban gap, and Alignment of subject choices with capabilities for success at the tertiary level. The primary sources of these data emerge from policy documents such as the Gaokao reform policy in Zhejiang Province and overseas curriculum blueprints such as IB Programme Standards and Practices. Student outcomes, such as university enrollment as seen in Jiang & Guo [8], form another data category.

Systematic Literature Synthesis combines 15 core literature sources, including Gaokao equity research carried out within the country [6,7], comparative research across various nations [4,5], and those that represented the views of students and teachers [2,9] to answer the research question of providing systematic evidence for Gaokao subject choice reform. Literature sources were searched through academic databases such as CNKI, Web of Science, and JSTOR using the search terms Gaokao subject choice, China educational equity, and alignment of high school and university, checked for rigor in terms of sample size and data gathering methods. The limitations of the research include that it recognizes there is personal bias in autobiographical research methods, but that such biasing can indirectly be reduced by using the technique of literature triangulation. The research only considers subject selection reform in Gaokao but not Gaokao as a whole (for example, Gaokao testing format), as it recognizes that the Gaokao subject selection gap is the main factor that affects students' comprehensive growth. The research only includes high school students in grades 10-12 who select Gaokao subjects and excludes students from primary school. The research doesn't include quantitative research by Gaokao students on psychology/motivation.

4. Results

The research generated three key findings, applicable on the basis of narrative inquiry, comparative study, and literature synthesis, which frame reformable action for the Gaokao subject choice system.

4.1 Root Causes of the Existing System

Narrative and literature data confirm the arts-science dichotomy drives early, uninformed specialization: Davey et al. note 68% of lower-secondary students choose subjects without proper career guidance, while the author observed mainland students opting for streams due to parental pressure (e.g., sciences for better jobs), findings supported by Muthanna & Sang [2], who found 78% of undergraduates regretted their lower-secondary subject choices by their second year (as shown in Table 1). Urban-rural equity gaps in subject access are also significant: Jing & Liu [6] found rural students (even with equal academic ability) are 30% less likely to choose science streams—with top-quartile rural students having a 30-percentage-point lower science enrollment rate than their urban peers (Table 2), and Zou [7] adds urban students have better access to career guidance and interdisciplinary resources; the author's rural outreach experience also showed rural schools lack electives beyond formal arts/science tracks. Additionally, the system fails to prepare students for university: Jiang & Guo [8] found 75% of secondary courses focus on rote learning (vs. university's focus on analysis), matching Table 3's data that 82% of class time goes to exam drilling; Yaxi & Bakar [9] note teachers prioritize drilling over critical thinking due to Gaokao metrics, leading 38% of first-year students to face academic anxiety [2] with university tasks.

4.2 Advantages of Flexible International and Domestic Models

4.2.1 International Interdisciplinary Frameworks

Wright [5] noted greater learner engagement of Chinese international schools with flexible subject systems (e.g., IB): 76% of IB students reported greater ability to link ideas between subjects compared to Gaokao students. Wu & Koh [10] noted the programs avoiding dual splits so students may major, e.g., biology and literature at the same time, gaining integrated competence. Table 4 compares learner engagement by curricular models.

Table 4. Student Engagement Scores by Curricular Model (1=Low, 5=High) [5].

Curricular	Average Engagement Score	Sample Size
IB Program	4.3	2,000
A-Level Program	4.0	1,800
Traditional Gaokao	3.1	5,000

4.2.2 Domestic Pilot Reform Success Kicking off

Jiang & Guo [8] surveyed the Zhejiang 3+3 Gaokao pilot (allowing students to pick 3 electives from streams) and recorded pleasing results: a 25% rise in rural students picking science majors, and 60% of respondents saying more alignment between secondary studies and career aims. Table 5 outlines the effect of the Zhejiang pilot upon rural enrollments in the sciences:

Table 5. Rural Student Science Enrollment Before vs. After Zhejiang 3+3 Pilot [8].

Period	Rural Science Enrollment Rate
Before Pilot (2018)	38%
After Pilot (2022)	63%

4.2.3 Reform Pathways for China's Context

Synthesizing findings, two contextually appropriate reform directions for China carry clear significance: replacing the forced arts-science dichotomy with a core+electives scheme (e.g., Zhejiang's 3 core subjects+2 cross-stream electives) and promoting secondary-university collaboration—both not only reduce premature specialization but also safeguard the Gaokao's true meritocracy (letting students choose based on interests rather than constraints) and narrow urban-

rural gaps, as seen in Zhejiang's pilot where rural students' science access rose notably. These reforms, however, face practical challenges: rural schools lack resources for interdisciplinary courses, and teachers (long focused on Gaokao drilling) resist shifting to interdisciplinary teaching due to skill gaps and unclear evaluation standards. To address these, targeted solutions are needed: build a national Interdisciplinary Online Course Platform (e.g., offering Science and Society) with special rural funding to fix resource inequities [7]; adjust teacher evaluation metrics to weight interdisciplinary teaching at 30% of annual assessments; and launch Teacher Interdisciplinary Training Camps (modeled on IB templates [10]) to build educators' skills—while secondary-university collaboration (via regional university faculty committees) can align high school math with university abstract reasoning requirements, correcting the curricular mismatch Jiang & Guo [8] observed.

5. Discussion

The findings illuminate the fact that it is not merely improving flexibility to reform the Gaokao subject selection system, but balancing meritocracy and equity, and conditioning students to the demands of today's society. The core+electives system maintains Gaokao's excellence selection tradition by providing objective core assessments while increasing the scope of electives. The Zhejiang pilot trial (Table 5) illustrates that it increases subject options, overcoming rural-urban disparities in subject choices, and rural students get to explore science without abandoning the arts. According to Abouchedid [4], it follows international best practices by eliminating excellence selection bias found in global designs [11] and addressing the inequities of Gaokao. In contrast to global initiatives, it appears that China's Gaokao reform should address both scalability and equity in educating a mass of students with varied needs, particularly in rural zones. Joint curriculum design solves the problem that Yaxi & Bakar [9] and Muthanna & Sang [2] identified. Since universities collaborate on the curriculum at the secondary levels, students acquire university-ready capabilities, such as math at the high school level that emphasizes abstract thought [8]. Wright [5] discovered that students in schools that partner with universities had 40% higher transition success due to applied curricula. However, challenges exist since the objectives of both the secondary and higher institutions differ, with varied communication cycles. Two key reform challenges need targeted fixes. For rural schools lacking interdisciplinary electives: the government could launch province-wide online platforms (e.g., Cross-Stream Elective Hub with courses like Ecology and Social Governance) and quarterly workshops for rural teachers (partnering with urban schools to share lessons), building on Zou's [7] resource gap solutions. For teacher resistance to change related to Gaokao-oriented pedagogical practices: modify the assessment of teachers to include 30% emphasis on designing interdisciplinary classes and students' critical thinking capabilities. Provide training costs along the IB model on 'Interdisciplinary Pedagogy Bootcamp' lasting 6 weeks.

This particular analysis only deals with subject choice reform in Gaokao without considering the other issues related to Gaokao. For instance, it overlooks the issue of the frequency of the exams. Although this particular analysis provides an in-depth look at subject splits in arts and science subjects, it overlooks connections with subject flexibility reform.

6. Conclusion

This paper verifies that even as China's Gaokao subject choice system provides the backbone of the country's system of meritocracy, it encounters three challenges: early specialization, educational inequalities, and a mismatch between high school and college curricula. These form barriers that prevent students from flourishing in an interdisciplinary world. Furthermore, based on the cross-cultural experience of the researcher and findings from both local and overseas research, two reform principles emerge as being crucial: flexible subject options across streams and interdisciplinary electives, as well as co-design of the curriculum by secondary schools and universities. These reforms

are designed in the Chinese context: they retain the role of Gaokao as a catalyst of upward mobility while closing equity gaps and curriculum mismatches. For example, these changes have already led to an increase of 25% in rural students' access to science stream classes in Zhejiang's pilot program. Flexibility and equity need not be at odds with each other. In the end, the role of education should be to prepare students for life itself and not just the exams. The proposed changes now shift the system of subject choices in Gaokao towards promoting the overall growth of students and developing talents that excel in more than one area. The proposed research should include these changes on a larger pilot scale, such as the regions of China, with long-term research on the effectiveness of these changes and their intersection with the psychological growth of students to gain comprehensive knowledge on whether Gaokao is adapting to the needs of the modern world.

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