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The Tripartite Logic of Building a Leading Country in Education: A Comparative Study of European Models

La Lógica Tripartita de la Construcción de un País Líder en Educación: Un Estudio Comparativo de los Modelos Europeos



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I. INTRODUCTION

In the global process of national modernization, education has increasingly become a key pillar of a country's comprehensive strength. A leading country in education broadly refers to a nation with education strength, educational innovation capacity, talent cultivation and the capacity to serve national strategic goals, as well as strong international competitiveness and influence in education (Zhang, W. & Zhou, H. Y., 2022). Europe has long been at the forefront of this pursuit, consistently achieving world-leading outcomes in promoting educational equity, ensuring quality, and aligning education with national development priorities.

As education systems worldwide face common challenges such as demographic transitions, technological disruptions, and deepening inequalities. Leading European countries in education exhibit notable institutional resilience and policy coherence in addressing these issues. Their experiences reinforce the idea that education is not merely a process of knowledge transmission, but a foundational driver of national development, scientific progress, and global competitiveness. According to the Education Rankings by Country 2025 published by the World Population Review, European countries demonstrate outstanding performance: the UK, Germany, France, Switzerland, Sweden, Denmark, the Netherlands, Norway and



EXECUTIVE SUMMARY

This study explores the foundations of building a leading country in education through a comparative analysis of nine European cases, including Finland, Sweden, Norway, Denmark, the United Kingdom, Germany, France, Switzerland, and the Netherlands. Using a qualitative multiple-case framework, the research identifies three core dimensions: equity, quality, and strategic alignment. European systems advance equity through inclusive legislation, targeted resource allocation, and after-school services; ensure quality via diversified structures, high standards in teacher education, and rigorous evaluation; and achieve strategic alignment by fostering innovative and STEM talents to support national development. Despite institutional diversity, these countries display policy coherence and resilience, offering valuable lessons for global education reform. The findings suggest that combining universal principles with localized practices is essential for countries seeking to construct equitable, high-quality, and innovation-driven education systems.

RESUMEN DEL ARTÍCULO

Este estudio explora los fundamentos para la construcción de un país líder en educación mediante un análisis comparativo de nueve casos europeos: Finlandia, Suecia, Noruega, Dinamarca, el Reino Unido, Alemania, Francia, Suiza y los Países Bajos. A través de un marco cualitativo de estudios de caso múltiples, la investigación identifica tres dimensiones centrales: equidad, calidad y alineación estratégica. Los sistemas europeos promueven la equidad mediante legislaciones inclusivas, asignación focalizada de recursos y servicios extracurriculares; garantizan la calidad a través de estructuras diversificadas, altos estándares en la formación docente y evaluaciones rigurosas; y logran la alineación estratégica fomentando talentos innovadores y STEM para apoyar el desarrollo nacional. A pesar de la diversidad institucional, estos países presentan coherencia y resiliencia en sus políticas, ofreciendo lecciones valiosas para la reforma educativa global. Los hallazgos sugieren que combinar principios universales con prácticas localizadas es esencial para los países que aspiran a construir sistemas educativos equitativos, de alta calidad y orientados a la innovación.

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Finland rank among the global top 15. These countries demonstrate systematic excellence in advancing educational equity, maintaining high quality, and ensuring strategic alignment with national priorities. However, their internal frameworks vary significantly in institutional arrangements and pathways to success. Conducting a systematic comparison of the universal patterns and distinctive insights underpinning their success can provide valuable guidance for education reform worldwide, offering valuable lessons for designing systems that are inclusive, high-quality, and strategically aligned with broader developmental goals. The research question we pose is: What shared patterns and logics underpin the sustained preeminence of leading European countries in education, despite their diverse developmental pathways? To answer this, the analysis adopts three core perspectives: equity, quality and strategic alignment, and presents European models. The study puts forward conclusions and discussions regarding the key findings and implications.

2. METHODOLOGY AND ANALYTICAL FRAMEWORK

2.1. Research Design

This study employs a qualitative comparative case study design to examine the shared patterns and logics underlying the sustained global leadership of European countries in education. The research adopts a multiple-case study approach, focusing on leading European education systems to identify common characteristics and successful practices across different national contexts while acknowledging their heterogeneous developmental pathways.

2.2. Analytical Framework

The comparative analysis is structured around three interrelated dimensions derived from the research question:

- 1. Equity Dimension: Examining fairness and inclusion in educational opportunities, processes, and outcomes.
- 2. Quality Dimension: Analyzing system diversity, professional capacity, and evaluation mechanisms.
- 3. Strategic Alignment Dimension: Investigating the alignment between education systems and national development priorities,

particularly in innovation and STEM education.

This framework allows for systematic comparison across cases while maintaining sensitivity to contextual differences.

2.3. Case Selection

The selection of cases follows a purposive sampling logic, grounded in three main criteria:

- 1. Global Educational Standing: Countries consistently ranking in the top 15 in authoritative international education indices (e.g., World Population Review, OECD PISA, UNESCO Education Index).
- 2. Policy Innovation and System Resilience: Documented track record of policy reforms that have demonstrably improved equity, quality, or strategic alignment over the past two decades.

Applying these criteria yields the following cases: Finland, Sweden, Norway, Denmark, the United Kingdom, Germany, France, Switzerland, and the Netherlands. This selection captures a representative spectrum of governance traditions, welfare regimes, and education system structures. Nevertheless, it is important to acknowledge that the concept of “countries leading in education” is constructed through specific metrics that may not capture all dimensions of educational success. International rankings may privilege certain outcomes (e.g., standardized test scores) over others (e.g., creativity, civic engagement), and national averages can mask internal disparities across regions, urban-rural divides, and minority populations. This study uses the term pragmatically to refer to countries with consistently strong performance across multiple indicators, while remaining aware of these limitations.

2.4. Documentary Sources and Analysis

This study primarily relies on documentary analysis of policy texts, legislative frameworks, and official reports from national education ministries and international organizations (OECD, UNESCO, European Commission). Documentary sources include national education acts, strategic policy etc. The analysis identifies common patterns across selected cases through structured comparison within the three analytical dimensions.

KEYWORDS

The leading country in education; educational equity; education quality; strategic alignment in education.

PALABRAS CLAVE

País líder en educación; equidad educativa; calidad educativa; alineación estratégica en educación.

3. EQUITABLE EDUCATION: THE CORNERSTONE OF LEADING COUNTRIES IN EDUCATION

Equity in education, as defined in the OECD report No More Failures, serves as a key concept in our analytical framework and can be seen through two dimensions: fairness and inclusion (OECD, 2012). Education as inclusion means ensuring that all students reach at least a basic minimum level of skills. Equitable education systems are fair and inclusive and support their students to achieve their potential. Equity as fairness implies that personal or socio-economic circumstances, such as gender, ethnic origin or family background are not obstacles to educational success (OECD, 2019). In Europe, countries leading in education prioritize equity at the core of their education agendas. Through implementing diverse support measures, optimizing resource allocation, and developing comprehensive after-school service systems, these countries have built interconnected and synergistic strategies that collectively advance the goal of educational equity.

3.1. Equity in Opportunities: Ensuring Equal Starting Points for Every Student

Educational opportunity equity serves as the foundation of overall educational equity and plays a critical role in ensuring fair starting points for individual development, which refers to the assurance that all students have the same chances to access and complete education, regardless of their family background, socioeconomic status, physical condition, or ethnicity. Therefore, some European countries have been committed to providing targeted legislative protections, policy supports, and financial assistance to ensure that educational opportunities are accessible to all.

First and foremost, educational equity has been elevated to the level of national legislation and strategic planning by leading European countries in education, and has been integrated into national development agendas as a core. This institutional commitment ensures the continuity, authority, and coherence of related policies, thereby effectively safeguarding equal access to education for all individuals. Countries such as Finland, Denmark, and Norway, often regarded as exemplary welfare states, have long adhered to the “Nordic model,” which is deeply rooted in the values of social inclusion and democratic participation. Their education systems emphasize social justice, equality, and social cohesion, aiming to provide high-quality and equitable education to all citizens, regardless



of personal resources, social background, or geographic location. For example, Norway's *Education Act of 1998 and the Knowledge Promotion of 2006* emphasize that equal educational opportunities must be provided to all individuals, regardless of abilities and aptitudes, age, gender, skin color, sexual orientation, social background, religious or ethnic background, place of residence, family education or family finances (Kamil ÖZERK, 2013).” Moreover, Norway’s Education Act not only guarantees the right to education for all children but also places particular emphasis on the inclusiveness of the education system for foreign children. Similarly, the legal frameworks in Finland, Norway, and Sweden go even further by extending the right to education to all children residing in their countries, regardless of their legal immigration status, aiming to support each individual’s development based on their own interests. These legal frameworks provide a solid institutional foundation for promoting educational equity.

In addition to achieving equity in education through making policies and legislation, some European nations place particular emphasis on providing adequate financial assistance. Through targeted support, they aim to alleviate the economic burden faced by disadvantaged groups in accessing education, thereby ensuring fair financial treatment in educational opportunities. In terms of financial grants, Finland is actively considering a revision of its core education funding formula. Under the new approach, additional funding would be directed toward schools with lower parental education levels, higher proportions of language learners, and those located in sparsely populated areas (European Agency, 2023). This reflects a shift in Finland’s public education investment strategy—from a model of universal equity to one of compensatory equity. In terms of living subsidies, the United Kingdom has also taken measures to alleviate the financial burden on students and their families. For instance, *the Free School Meal Program* in public schools allows families with limited financial means, those receiving welfare benefits or asylum support, and households without earned income to apply for free meals for their children (U.K. Department for Education, 2018). Besides, disadvantaged students receive supplementary education allowances and are provided with targeted academic support to help improve their academic performance (U.K. Department for Education, 2018). These measures are designed to address educational inequality by ensuring that students from vulnerable backgrounds are not further disadvantaged due to financial constraints.



3.2. Equity in Process: Optimizing the Allocation of Educational Resources

The allocation of educational resources constitutes a pivotal determinant in achieving procedural equity within education systems. Across European countries leading in education, targeted strategies have been implemented to address disparities in resource distribution. Beyond the equitable provision of public funding, particular emphasis has been placed on the balanced allocation of essential inputs, such as qualified teaching personnel and digital infrastructure, with the aim of progressively narrowing regional disparities and promoting a more equitable educational landscape.

Teachers are the most essential resource in educational development, and the equitable distribution of teacher resources is critical to the realization of educational equity. Even in developed countries, remote and rural areas often face persistent challenges such as the outflow of high-quality teachers, comparatively lower teacher qualifications, and limited access to professional development opportunities. To address these issues, some European countries have established comprehensive compensation and incentive systems aimed at improving teacher retention in remote regions. Measures such as increased salaries, housing subsidies, and tax exemptions are employed to enhance teachers' sense of professional belonging and job satisfaction. For instance, France has designated "*Priority Education Zones*" from 1981 based on factors such as geographic location, socioeconomic context, school conditions, and employment indicators, offering teachers in these areas various living allowances and financial benefits (European Commission,2023). In addition, many leading education systems emphasize the importance of professional development for teachers in remote areas. Some countries provide rich training resources and development opportunities to support teachers' academic advancement and career growth, thereby enhancing their professional capacity and motivation. The United Kingdom has implemented the *National Teaching Service*, a policy initiative designed to attract high-performing teachers to work in rural or disadvantaged schools. Participating teachers receive financial subsidies, along with access to high-quality training, career development pathways, and promotion opportunities (U.K. Government, 2016). These strategies collectively aim to raise the overall quality and effectiveness of teaching staff in under-resourced areas.



Digital technologies have opened new pathways for promoting educational equity in recent years. However, alongside the benefits brought by digital transformation, the issue of the digital divide in education has become increasingly prominent, and in some cases, has exacerbated educational inequalities for certain marginalized groups. In response, some European countries have adopted multifaceted strategies, ranging from policy formulation to financial investment, to coordinate the planning and deployment of digital resources, with the goal of advancing technological equity in education and narrowing the digital divide. From the perspective of national policy, many countries have incorporated principles of equity and inclusion into their digital education strategies, offering top-level designs and systemic frameworks to guide the equitable development of educational technologies. In 2023, Finland released the *Policies for the Digitalisation of Education and Training until 2027*, a dedicated policy initiative outlining how digital tools can be leveraged to support learners' personalized needs, enhance educational accessibility and equality, and promote collaboration and sustainable learning among diverse student groups (Finland Ministry of Education and Culture, 2023). In terms of financial investment, many countries have significantly increased targeted funding for the development of digital infrastructure and software in the education sector. In Germany, the *Digital Strategy 2025 Programme* was launched in 2016, aiming to complete all relevant infrastructure construction by 2025 to meet the digital education needs of all primary and secondary schools across the country (Federal Ministry for Economic Affairs and Energy of Germany, 2016).



3.3. Education in Outcomes: Establishing an Integrated After-School Service System

After-school services, as an extension of formal school education, typically refer to publicly funded educational support provided to primary and lower secondary school students during the compulsory education stage. Many European countries place great emphasis on legislative frameworks and policy planning for after-school services, ensuring sustained financial support while safeguarding the rights of disadvantaged groups. These efforts aim to reduce disparities across urban and rural areas, regions, and schools, protect marginalized students' access to after-school education, and promote outcome equity on the basis of equity in both educational opportunities and processes.

Many European countries have introduced a series of policies and regulations to formalize the legal status of after-school services. At the same time, they continue to improve supporting policies and implementation mechanisms to establish a dual-track system of provision and protection, ensuring the sustainable and orderly development of after-school programs. The United Kingdom was one of the first countries to establish formal after-school services. In 2004, the British government released *Choice for Parents, the Best Start for Children: A Ten-Year Strategy for Childcare*, which raised standards for the number of childcare institutions, service quality, and funding levels to ensure that children receive high-quality after-school care. In 2008, the Department for Education issued the *Early Years Foundation Stage (EYFS) Statutory Framework*, which set out specific learning, development, and care standards for children under 5 years old, thereby creating an integrated childcare system that spans policy implementation, quality evaluation and welfare support (U.K. Department for Education, 2014).

Beyond policy and legal frameworks, leading European nations in education also provide robust financial support for after-school services. Funding is drawn from a variety of sources, including central and local government budgets, as well as donations from corporations and philanthropic organizations. Special financial assistance is also made available for disadvantaged groups to ensure their equal access to these services. Denmark has implemented *Inclusion-Promoting Steering Models*, a fiscal incentive mechanism designed to foster inclusive education. At its core, this approach reallocates funds previously earmarked for special education schools to regular schools, thereby enhancing their willingness and capacity to support students with special educational needs (Tegtmejer T., 2022). Moreover, in Finland and Sweden, the vast majority of after-school service costs are covered by the government. This significantly reduces the financial burden on families and enhances access for all children. To accommodate families with varying economic capacities, governments implement tiered fee structures based on household income levels. Additional subsidies are provided to eligible families, ensuring that children from different socioeconomic backgrounds can enjoy equitable and high-quality after-school services.



4. HIGH-QUALITY EDUCATION: THE ENGINE OF ELEVATING NATIONAL COMPETITIVENESS

Education quality serves as a core indicator of a nation's educational standards and a key factor in determining whether education can effectively support national development and social progress. Across Europe, leading education nations exhibit common strategies in pursuing high-quality educational development, which consistently focus on building diversified education systems, cultivating high-quality teaching professionals, and refining scientifically rigorous and targeted evaluation mechanisms. These elements are deeply interconnected and mutually reinforcing, together forming a robust and dynamic framework for advancing education quality.

4.1. Building a Diversified Education System to Meet Evolving Educational Needs

A well-structured education system should ensure vertical continuity across all stages and horizontal integration across disciplines and pathways. By promoting coherence and diversity within the system, it can better address varied learner needs, enhance educational efficiency and quality, and foster students' holistic development and innovative capacity.

From a vertical perspective of national education systems, one common characteristic among leading European countries in education is the establishment of a coherent and well-articulated structure that seamlessly connects all educational stages. Each stage is governed by explicit goals and standards, with transitional mechanisms designed to ensure continuity of learning and to prevent developmental constraints arising from premature academic tracking. Finland offers a notable example of this approach. Early childhood education there prioritizes the physical, emotional, and social well-being of children. This is followed by a preschool stage, which functions as a bridge from play-based early learning to the knowledge-oriented basic education curriculum. Basic education is delivered through an integrated 9-year program within comprehensive schools. Additionally, some comprehensive schools offer a voluntary 10th grade, enabling students to further explore personal development pathways and make informed career choices prior to entering upper secondary education. At the upper secondary level, Finland implements a dual-track system comprising academic education and vocational education. Upon completion of basic education, students



select their pathway in accordance with their individual educational plans and aspirations, thereby ensuring alignment between personal goals and educational trajectories (Pasi Sahlberg, 2021).

The horizontal integration of vocational and general education is a fundamental characteristic of high-quality education development and a key component in deepening education system reforms and advancing the construction of strong education nations. Germany, as a representative of the dual educational system, primarily exemplifies the bidirectional permeation model. While maintaining the independence of vocational and general education pathways, Germany facilitates student exposure to both systems through shared curricula and extracurricular activities related to vocational education. Governed by the *Vocational Training Act*, the system spans fields such as engineering, law, economics, and business. Beyond secondary education, Germany has extended this model into higher education through *Dual Study Programs*, which combine academic coursework at universities with practical training in companies, strengthening the link between education and industry. Similarly, Switzerland's vocational education and training (VET) system, for instance, integrates workplace-based apprenticeships with classroom instruction and provides pathways for VET graduates to enter higher education through applied universities (Deissinger, T., & Gonon, P., 2016).

4.2. Empowering Education through a High-Quality Teaching Force

Teachers serve as pivotal agents in driving pedagogical progress. Leading European countries in education have prioritized the strengthening of their teaching workforce by establishing rigorous entry standards, setting clear professional benchmarks, and promoting continuous professional development. These measures are designed to ensure that teachers can effectively fulfill their critical functions within the education process, fostering high-quality talent for national and societal development.

To ensure a high-quality teaching workforce, some European countries have developed teacher admission systems tailored to their national contexts. These systems emphasize both academic rigor and professional aptitude in selecting future educators. On one hand, many countries have raised the academic threshold for entry into the profession. For instance, the teacher education system in



Finland is renowned for its high selectivity and academic excellence. The admission rate for its teacher training program is extremely low; typically only about 10% of applicants are successfully admitted (Tirri Kirsi, 2014). All primary and secondary school teachers need to obtain a master's degree in the field they teach and receive an additional year of education training (Tirri Kirsi, 2014). This highly academic requirement ensures that teachers are not only transmitters of knowledge but also researchers in education and teaching. On the other hand, several European countries have increased the selectivity of teacher education programs by introducing more rigorous entrance examinations, multi-phase assessment procedures, and holistic evaluations of applicants' competencies. Germany's teacher education system emphasizes both theoretical grounding and practical training. Initial preparation spans a minimum of five years and culminates in a master's qualification. The first phase consists of academic study at a university, leading to the First State Examination (Erste Staatsexamen). Subsequently, candidates enter a two-year Preparatory Service, engaging in mentored teaching practice. Upon successful completion of the Second State Examination (Zweite Staatsexamen), candidates are formally qualified to teach (Jesús et al., 2019). These reforms aim to attract top-performing students into teacher training programs and ensure that only those with strong pedagogical abilities and a genuine commitment to education are admitted.

Leading European countries in education have emphasized the importance of continuous professional development for teachers, recognizing it as essential to maintaining instructional quality and adapting to the evolving demands of education. Rather than viewing teacher competence as static, these nations have constructed robust, full-career development frameworks. Finland and France offer two contrasting yet complementary models. In Finland, teacher development is deeply embedded in a culture of professional trust and autonomy. For national priorities, Finnish universities develop and deliver advanced training programs with government funding, open to all teachers and school leaders across the country. Rather than mandating formal induction or probation periods, Finland places confidence in its highly selective teacher education system and grants new teachers full professional status from their first day of employment (Niemi, H., 2015). This structure not only reflects trust in teachers' professional skills but also encourages innovation and self-



directed learning as key features of their development. In contrast, France adopts a centralized and state-driven model. Teachers, as civil servants, follow nationally unified training plans developed by the Ministry of Education, which define priority areas for professional development, such as civic values, equity, and inclusive education. Continuing education is a legal obligation, with, for example, primary school teachers required to complete a minimum number of training hours annually. Novice teachers receive structured mentorship during their induction period, guided by experienced colleagues (European Agency for Special Needs and Inclusive Education, 2023). Whether through decentralized autonomy or centralized coordination, both approaches ensure that teachers are continuously empowered to grow professionally, adapt to change, and contribute to the sustained improvement of national education quality.

4.3. Establishing Scientific Evaluation Systems to Support Educational Excellence

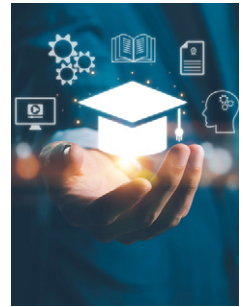
Establishing a scientifically grounded mechanism for evaluating educational quality is a crucial means of ensuring the steady improvement of education. Continuous monitoring of the educational process enables the timely identification and resolution of existing problems and deficiencies, thereby providing an evidence-based foundation for refining pedagogical practices and enhancing overall educational outcomes.

In terms of evaluation actors, leading European education systems have generally established a multi-stakeholder framework in which both internal self-assessment and external supervision are balanced. However, the distribution of authority within these frameworks varies across countries, reflecting differences in governance structures and educational traditions. For instance, Finland and the United Kingdom illustrate two distinct approaches to educational evaluation: one centered on trust and autonomy, emphasizing internal supervision; the other focused on accountability and regulation, reinforcing external oversight. Finland emphasizes a collaborative, school-centered model, where evaluation serves developmental purposes. The government acts as an enabler, setting frameworks, funding initiatives, and commissioning independent agencies like the Finnish Education Evaluation Centre (FINEEC) to support schools through feedback rather than control. Schools hold primary responsibility for self-evaluation, which is formative and improvement-oriented. In



contrast, the UK adopts a more hierarchical, externally driven model. Independent agencies such as the Quality Assurance Agency (QAA), the Office for Students (OfS), and UK Research and Innovation (UKRI) are each responsible for specific domains such as teaching quality, student protection, and research performance (Ofsted, 2023). This system emphasizes institutional responsibility, using external pressure as a mechanism for continuous improvement. Both models reflect two governance logics: Finland's empowerment-based approach and the UK's accountability-driven framework. Despite their differences, both stress multi-actor participation and system-wide quality improvement.

Another common feature across leading European education systems is the diversification of evaluation elements, which typically focus on three key dimensions: student development, teacher quality, and institutional performance. To begin with, in terms of student development, countries have moved beyond knowledge-based assessments to emphasize comprehensive competencies and future-oriented competence. For instance, Finland's National Core Curriculum for Primary and Lower secondary (Basic) in 2014 outlines seven transversal competences, including thinking and learning to learn, cultural competence, interaction and self-expression, Taking care of oneself and managing daily life, multi-literacy, ICT competence, working life competence and entrepreneurship, and participation involvement and building a sustainable future (Finish National Agency for Education, 2014). These competences are always taught, studied and assessed as part of the different subjects, and are assessed primarily through formative methods. In the second place, teacher quality is evaluated using both quantitative and qualitative indicators. Traditional models, like the UK's performance-based accountability mechanisms, often assess teachers by tracking changes in students' academic performance. However, recognizing the limitations of purely quantitative metrics, many European countries now adopt more holistic approaches that incorporate qualitative dimensions such as professional competence, collaboration, organizational ability, and interpersonal skills (The Office for Standards in Education, 2015). Finally, school evaluation considers a combination of student outcomes, teacher professionalism, and leadership effectiveness. In the UK, for example, the Common Inspection Framework (CIF) guides the evaluation of school quality, focusing on core indicators such as academic achievement, leadership and management, teaching quality, and student behavior and safety.



**5. INNOVATION TALENT DEVELOPMENT: ALIGNING HUMAN
CAPITAL WITH NATIONAL STRATEGIC NEEDS**

Science, talent, and innovation are intrinsically aligned and mutually reinforcing. Scientific progress relies on talent, and talent development is grounded in education. Against the backdrop of accelerating globalization and intensifying technological competition, aligning education with national strategies for talent cultivation has become increasingly vital. Leading European countries in education have prioritized the development of innovative and STEM talent as a core objective of their educational agendas, meeting national strategic development needs.

**5.1. Nurturing Young Leading Innovators to Advance
Scientific and Industrial Development.**

Innovative talents are central to national development. Their expertise, curiosity, and creativity fuel scientific breakthroughs, guide industrial transformation, and contribute to the ongoing evolution of an advanced education system. European countries are committed to developing diverse selection mechanisms and distinctive training models for top innovative talents, aiming to cultivate a large pool of interdisciplinary and creative professionals to serve national development.

In the early identification of innovation talents, European countries adopt a dual approach that combines quantitative and qualitative evaluation. Quantitative assessments typically rely on standardized aptitude tests to identify students with exceptional potential. In contrast, qualitative methods such as interviews, teacher recommendations, and community-based discovery serve as essential supplements, offering a more holistic perspective on individual capabilities. At the university admission stage, selection mechanisms for high-potential students generally fall into two categories: access-based and competition-based. Access-based selection includes entrance examinations and institutional recommendations; for example, partnerships between Schiller University and the Zeiss Specialized School, or Humboldt University and the Hertz Specialized School, enable early identification and recruitment of talented students at the primary and secondary levels (Li, M. Z., & Sun Y. Y., 2024). Competition-based selection emphasizes academic research, scientific innovation, and invention-related contests, many of which are directly aligned with national or industrial needs, thereby



enhancing their practical relevance and real-world applicability. A typical example is the *European Union Contest for Young Scientists* (EUCYS), supported by the European Commission. Countries like Sweden select participants through national contests such as *the Young Scientists Exhibition (Utställningen Unga Forskare)*. Winners gain opportunities to present projects in areas like environmental science, biotechnology, and engineering. This model not only identifies promising young talents early but also strengthens their connection to real-world research and industry applications.

In terms of models for cultivating innovation talents, European countries have developed distinctive ways with a shared focus on nurturing interdisciplinary, multi-skilled individuals capable of driving scientific research and industrial advancement. In the early stages of talent development, many countries adopt two main approaches for gifted children: acceleration and enrichment. Acceleration typically involves curriculum extension, allowing capable students to access advanced or innovation-oriented courses at an earlier age. Enrichment, on the other hand, refers to providing additional content that deepens and broadens learning, tailored to the specific intellectual needs of exceptionally talented students. For example, Germany and France both prioritize early identification and development of gifted talents through tailored education pathways. Germany offers flexible learning, grade-skipping, and talent classes, with support from research institutes and industry. France selects high-potential students early and channels them into elite preparatory programs like the *Preparatory Classes for the Grandes Écoles (Classes Préparatoires aux Grandes Écoles)*, leading to top institutions in France. Both systems aim to nurture innovation through enriched, accelerated education. In the advanced stages of cultivating top innovative talents, leading European countries in education focus on integrating academic and practical training. Universities serve as key platforms, offering strong academic foundations and diverse interdisciplinary programs. In the UK, many institutions emphasize their academic strengths by developing cross-disciplinary courses tailored to specific innovation fields. Germany upholds the unity of teaching and research, using formats like seminars to foster independent learning and innovation (Cao D.M., 2008). Both countries actively promote university-industry collaboration, aligning education with demands to develop high-quality and skilled talents.



5.2. Developing STEM Talent to Advance Technological Self-Reliance and National Strength

With the accelerating pace of technological revolution and industrial transformation, STEM talent has become a crucial force in driving productivity breakthroughs and fostering high-quality social development. European leading countries in education have continuously refined their STEM education systems by strengthening policy guidance and innovating talent development models, aiming to improve the quality and effectiveness of STEM talent cultivation.

Leading European countries in education have integrated STEM education into national strategic planning, continuously strengthening policy guidance and developing top-level designs tailored to their specific national contexts. Germany and Finland, as two prominent educational powers in Europe with distinct characteristics, differ in their approaches but share common features of systematization, coherence, and forward-looking orientation. In Germany, the government plays a crucial role in promoting STEM education. The *MINT (STEM) Action Plan 2.0* was published in 2019 and defined four fields of action: STEM education for children and young people, STEM professionals, opportunities for girls and women in STEM, and STEM in society (Federal Ministry of Education and Research, 2019). Moreover, the government supports this system through direct investment, funding, and by fostering partnerships between schools and leading industry, ensuring its stable operation and continuous innovation. Finland's *LUMA Strategy (2014-2025)* reflects a forward-looking approach to curriculum design. It goes beyond traditional instruction in mathematics, science, and technology by integrating STEM subjects with broader societal themes such as circular economy, ecology, social responsibility, and equity (Costello, E., et al., 2020). This interdisciplinary Phenomenon-Based Learning method aims to equip students with the ability to apply integrated knowledge to solve complex real-world problems.

If top-level design serves as the blueprint, then industry-academia-research collaboration is the key engine that transforms this blueprint into reality. Leading European countries in education continuously promote deeper integration of education, research, and industry. Through deep collaboration among enterprises, universities, and research institutions, a talent cultivation environment that integrates theory and practice is established. This model provides cross-disciplinary cooperation and communication platforms, aiming to



nurture high-level STEM talents aligned with national strategic needs. For example, some universities in the UK place great emphasis on building close partnerships with industry and enterprises. They promote the development of an integrated “industry-academia-research” talent training model through multiple approaches, such as patent transfer, the establishment of specialized science parks, the creation of new types of educational institutions, tailored postgraduate training programs, and industry-linked academic courses. In Germany, enterprises are not only providers of technology but also direct participants and stakeholders in education. In accordance with federal training regulations, companies are required to assign professional vocational trainers to students and conduct systematic skills assessments. This model ensures that what students learn aligns with industry needs, while allowing companies to identify and nurture future employees who match their specific requirements in advance.



6. CONCLUSIONS AND RECOMMENDATIONS

By sorting out and summarizing the laws of building a strong education country in Europe, it can be found that it has accumulated rich experience in long-term practice and demonstrated many common characteristics in terms of educational equity, quality and alignment with national development goals. Nevertheless, the political and economic systems, as well as the challenges posed to educational development, differ across countries. Hence, it is imperative to tailor our approach based on the stage-specific characteristics and practical demands of our own educational development, integrating scientific insights with localized practices, to establish an education system that aligns with current national circumstances and addresses development challenges.

6.1. Advancing Equity through Strategic Resource Allocation and Inclusive Policies

European leading countries in education consistently prioritize equity as a foundational goal. Firstly, they have developed the targeted allocation of educational resources, which serves as a foundational mechanism for reducing systemic disparities. These efforts are supported by comprehensive actions in areas like financial investment and the allocation of qualified teaching staff. In particular,

action plans are implemented to strengthen the capacity of under-resourced schools in remote areas. By increasing support for regions that are relatively underdeveloped in education, these measures help lay a solid foundation for achieving equality in educational services. Secondly, the development of a diversified and inclusive education support system is crucial. Particular attention is paid to the needs of disadvantaged student populations, ensuring their full participation and equal opportunities for academic and personal development. Beyond policy assistance and economic subsidies, institutional mechanisms are established to provide differentiated support. Tailored after-school services and compensatory education programs are offered to students at varying stages of development and with diverse cognitive and learning needs. These measures contribute to the ongoing improvement of public education services in terms of universality, accessibility, and responsiveness, and play a critical role in advancing educational opportunity, resource equity, and outcome fairness.

6.2. Enhancing Quality through Professional Capacity and Scientific Evaluation

Sustained investment in education quality is another shared characteristic. European leading countries in education align curriculum, teacher training, and evaluation mechanisms into coherent systems that promote both excellence and innovation. Firstly, Emphasis is placed on high standards for teacher recruitment, structured pathways for professional development. This involves enforcing stricter entry requirements into the teaching profession to attract and retain highly qualified individuals. In parallel, it is necessary to improve professional standards and career development frameworks to support teachers' continuous professional growth and self-improvement. Secondly, the education quality evaluation system requires systematic refinement. A more inclusive evaluation model can be achieved by incorporating diverse actors, including social organizations and enterprises, to build a multi-stakeholder framework that ensures objectivity and comprehensiveness in assessing education quality. Moreover, active participation in international education assessment programs can offer insights into global benchmarks while enriching the development of relevant local standards. Furthermore, promoting the integration of national, regional, and school-level evaluation systems encourages a more



coherent and decentralized approach, allowing each level to fully leverage its evaluative capacity within a unified framework. Taken together, these strategies contribute to building a high-quality, equitable, and internationally competitive education system.

6.3. Cultivating Innovative Talent to Align with National Development Priorities

Recognizing the growing importance of human capital in knowledge economies, European systems actively integrate education policy with broader national strategies. Firstly, a diversified approach to the selection and cultivation of innovative talent should be established. In terms of talent selection, emphasis should be placed on integrating both qualitative and quantitative evaluation methods, with clearly defined criteria for identifying innovative potential. Strengthening cooperation between universities and enterprises in the selection process can further enhance the effectiveness of talent identification. On the cultivation side, interdisciplinary curricula should be developed to promote integration across academic fields. The alignment of teaching with research is essential to training practice-oriented, innovation-driven professionals who possess both strong theoretical foundations and practical competencies. Secondly, optimizing the strategic layout of higher education in accordance with global development trends is critical for strengthening its role in driving scientific and technological innovation. Universities should accelerate breakthroughs in goal-oriented basic research and make significant advances in core technologies essential to national strategies. By fully leveraging their innovation leadership, universities can promote the transformation of research outcomes into productive forces. These efforts collectively contribute to the creation of a robust and dynamic ecosystem for educational innovation.



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