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Cross-Country Dispersion and Inequality in Compulsory Instruction Time: Evidence from OECD Primary and Lower Secondary Education

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ABSTRACT

This study measures and ranks cross country dispersion and inequality in the allocation of compulsory instruction time across curriculum subjects at two levels of education. Drawing on the OECD Education at a Glance database (Instruction Time per Subject by Level of Education), the analysis covers primary education (ISCED 1; N = 347 observations) and lower secondary general education (ISCED 2/24; N = 395 observations) across OECD member and partner countries. Six complementary dispersion and inequality indicators standard deviation, interquartile range, coefficient of variation, Gini coefficient, median absolute deviation, and inter-country range are computed at both the aggregate and subject levels, and synthesised into a composite inequality score via equal weighted percentile ranking. The results reveal three principal findings. First, primary education exhibits substantially greater cross country heterogeneity than lower secondary education on every indicator examined. Second, the dispersion hierarchy is sharply bifurcated: flexible, optional, and vocationally oriented curriculum categories (e.g., Subjects with Flexible Timetable, Options Chosen by Students, Non-compulsory Curriculum) display the highest inequality, whereas core academic subjects Mathematics and Reading, Writing and Literature show the strongest international standardisation. Third, inter-country ranges approaching 100 percentage points for flexible categories reflect fundamentally divergent national philosophies of curriculum design. The findings are interpreted through the ex-ante equality-of-opportunity framework, which treats country of schooling and curriculum category as circumstances beyond individual control, thereby framing instruction time inequality as a structural determinant of educational opportunity. The study contributes a transparent, multi indicator methodology for monitoring curricular convergence and divergence across education systems.

Keywords: Compulsory Instruction Time, Educational Inequality, Cross-Country Dispersion, OECD Education at a Glance, Coefficient of Variation, Gini Coefficient, Curriculum Policy, Equality of Opportunity, Composite Inequality Index

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1. Introduction and Background

Reducing inequalities is both a goal of human development and a means of promoting broader human development outcomes [1, 2]. Although a substantial proportion of the inequality literature has traditionally focused on the economic dimension of human development, increasing attention has been directed toward inequality in education. Educational inequality has been examined using a range of quantitative measures, including the standard deviation, the Gini index, and indices derived from the concept of entropy. A growing body of research has applied these measures to assess differences in educational opportunities and outcomes across populations and territories [3, 4, 5].

An important dimension of educational inequality is its geographical distribution. Geographic location can significantly shape the extent and nature of inequality [6], suggesting that spatial inequality should be considered alongside individual level inequality [7, 1]. Territorial disparities within countries may amplify inequalities among individuals [8] and may also affect socioeconomic outcomes [9]. Consequently, examining differences across territories is essential for understanding how educational opportunities and resources are distributed and for identifying disparities that may require targeted policy intervention.

The geographical dimension of educational inequality is shaped by several interconnected factors, including location, economic conditions, infrastructure, and the distribution of educational resources across territories. These spatial characteristics can influence access to education, the opportunities available to students, and, ultimately, educational outcomes [10]. The literature provides evidence of the importance of geographical variation in educational inequality and demonstrates the use of diverse empirical approaches to investigate this dimension. Fry et al. [11], for example, developed multidimensional empirical indicators for the provinces of Thailand, while Delprato et al. [12] highlighted the significance of spatial disparities in education and calculated attainment indicators for sub Saharan Africa. Mishra et al. [10] likewise conducted a descriptive analysis of geographical factors associated with spatial inequality in educational attainment.

Other studies have used established inequality measures to investigate regional and territorial differences in education. Using the Gini index, Senadza [13] examined regional educational inequality in Ghana, while Agrawal [14] analysed educational inequality between urban and rural sectors in India. Luo et al. [5] investigated educational inequality in China from a regional perspective. The Theil index has also been applied to examine spatial patterns of educational inequality. Karahasan and Uyar [15] studied the spatial distribution of education and regional inequalities in Turkey, whereas Rodríguez-Pose and Tselios [16] analysed educational inequality across European regions. In addition, spatial econometric approaches have been employed to investigate the role of geographical factors in educational inequality [17]. Niranjan [18], for instance, examined the influence of the spatial dimension on educational development in India using this methodology. Similarly, Loaiza Quintero and Hincapié Vélez [19] applied non-parametric methodologies to examine educational differences among Colombian municipalities. Collectively, these studies demonstrate that spatial variation is a significant component of educational inequality and reinforce the importance of examining disparities across territories rather than considering educational inequality solely as an individual level phenomenon.

Within the broader literature on education policy, instruction time represents an important dimension through which educational systems may differ. In discussing education policies across country chapters, Schnepf organised the analysis around three dimensions: (a) school autonomy versus centralisation; (b) tracking versus comprehensive schooling; and (c) instruction time and curricula [20]. This framing places instruction time alongside major institutional and curricular features of education systems and indicates its relevance for comparative analysis. In a related methodological contribution, Guijarro Garvi [21] introduced a two stage hierarchical decomposition of inequality for one half of the square of the coefficient of variation. Although the

citation details provided in the source text are incomplete, these references point toward the relevance of instruction time policies and decomposable inequality measures for analysing cross-group educational disparities.

Against this background, the coefficient of variation (CV) provides a particularly relevant measure for analysing inequality in compulsory instruction time. Although it is less widely used than some conventional inequality measures, the CV has several properties that make it well suited to comparative analysis. It is a unit free measure and can therefore be compared across groups with different average levels. It also belongs to the Generalized Entropy class with parameter 2 and consequently possesses the property of exact additive decomposability [22]. These characteristics make the CV especially useful when the objective is to distinguish between group inequality from within group inequality.

The decomposition of inequality into between group and within group components is also consistent with the exante equality of opportunity framework. In this perspective, differences associated with circumstances can be distinguished from differences related to individual effort, providing a conceptual basis for analysing how inequality is distributed across predefined groups [23, 24]. Applied to compulsory instruction time, such a framework can help identify whether observed dispersion is primarily associated with differences between groups or with variation within groups. Furthermore, the coefficient of variation can be interpreted as total variance expressed on a normalized, scale invariant basis rather than as a conceptually distinct measure of inequality. This property strengthens its usefulness for cross country comparisons in which education systems may differ substantially in their average levels of compulsory instruction time.

Taken together, the existing literature establishes the importance of spatial and cross group dimensions in the study of educational inequality, while the methodological properties of the coefficient of variation provide a suitable basis for examining dispersion in compulsory instruction time. A cross country analysis of OECD primary and lower secondary education can therefore contribute to the understanding of how compulsory instruction time varies across education systems and how this variation can be assessed in terms of inequality and dispersion. The combination of comparative instruction time data and an inequality framework offers a basis for identifying differences across countries and for examining the extent to which such differences are concentrated between or within relevant groups.

2. Research Statement

Despite the extensive literature on educational inequality at the individual and household levels, comparatively little systematic attention has been devoted to quantifying the extent to which *structural* features of education systems specifically, the allocation of compulsory instruction time across curriculum subjects vary across countries and, consequently, generate cross national inequality in the educational inputs that pupils receive. Existing comparative studies have largely focused on outcomes (test scores, attainment, completion rates) or on financial inputs (expenditure per pupil), while the temporal dimension of schooling how many hours are devoted to which subjects remains under examined as a source of measurable dispersion.

This gap is consequential for three reasons. First, instruction time is a fundamental policy lever: it determines the exposure each student receives to particular knowledge domains and is among the most directly controllable parameters of compulsory curricula [20]. Second, because instruction time allocations are set through national or sub national regulatory frameworks, cross country differences in these allocations reflect deliberate policy choices rather than stochastic variation, making them amenable to normative evaluation. Third, the degree to which instruction time is standardised or dispersed across education systems carries implications for equity of opportunity: if some countries allocate substantially more compulsory time to core academic subjects while others distribute time more diffusely across flexible or optional categories, students in different systems face structurally unequal learning conditions before any individual level effort or talent is considered.

The present study addresses this gap by examining cross country dispersion and inequality in compulsory instruction time allocation across OECD member and partner countries for primary (ISCED 1) and lower

secondary general education (ISCED 2/24). It asks: *How unequal is the distribution of compulsory instruction time across OECD education systems, and which curriculum categories are the principal drivers of that inequality?*

3. Purpose and Objectives

The overarching purpose of this study is to measure, rank, and interpret cross country inequality in the allocation of compulsory instruction time across curriculum subjects at two levels of education, thereby identifying where international standardisation is strongest and where national policy discretion produces the greatest divergence.

Specific objectives are as follows:

1. Quantify aggregate dispersion. Compute standard deviation, interquartile range, coefficient of variation, Gini coefficient, median absolute deviation, and inter country range for the full set of compulsory instruction-time observations at ISCED 1 and ISCED 2/24, establishing a baseline level of cross country heterogeneity at each educational stage.

2. Identify subject level sources of inequality. Replicate the same battery of dispersion and inequality measures for each curriculum domain (e.g., Mathematics; Reading, Writing and Literature; Natural Sciences; Social Sciences; Modern Languages; Arts; Physical Education and Health; ICT; Technology; Religion/Ethics/Moral Education; Practical and Vocational Skills; Flexible Timetable; Options Chosen by Students; Non-compulsory Curriculum; and residual "Other Subjects" categories) to determine which subjects exhibit the greatest and least cross country variation.

3. Construct a composite inequality ranking. Combine percentile ranks of the six dispersion indicators under an equal weighting scheme to produce a single composite inequality score per subject per education level, enabling a transparent, multi dimensional ranking from most to least internationally standardised.

4. Compare primary and lower secondary patterns. Assess whether the structure of cross-country inequality differs between ISCED 1 and ISCED 2/24, testing the hypothesis that greater curricular flexibility at the primary level generates higher dispersion.

5. Situate findings within an equality of opportunity framework. Interpret the between subject and between-level dispersion patterns in light of the ex-ante equality of opportunity literature, which distinguishes circumstances (here, country of schooling and curriculum category) from effort, thereby framing instruction-time inequality as a structural circumstance affecting educational opportunity.

4. Methods

4.1 Data Source and Description

Empirical data were obtained from the Organisation for Economic Co-operation and Development (OECD) *Education at a Glance* (EAG) database via the OECD Data Explorer. The specific dataset employed is "Instruction Time per Subject by Level of Education" (OECD.EDU.IMEP: DSD_EAG_IT@DF_EAG_IT_SUBJ_ISCED), which collects internationally comparable indicators on formal curriculum structures across OECD member and partner countries.

The dataset quantifies the proportion (%) and total annual hours of compulsory instruction time dedicated to specific subject areas at standardised educational levels classified under the International Standard Classification of Education 2011 (ISCED-11) framework. This study focuses on:

- ISCED 1 – Primary education (N = 347 valid observations);

• ISCED 2 / ISCED 24 – Lower secondary general education (N = 395 valid observations).

Only observations coded OBS_STATUS = A (Normal value) were retained, ensuring that provisional, estimated, or missing entries were excluded. Curriculum domains covered include Reading, Writing and Literature; Mathematics; Natural Sciences; Social Sciences; Modern Languages (Second Language and Other Languages); Arts; Physical Education and Health; ICT; Technology; Religion/Ethics/Moral Education; Practical and Vocational Skills; Subjects with Flexible Timetable; Options Chosen by Students; Flexible Subjects Chosen by Schools; Non-compulsory Curriculum; and Other Subjects.

4.2 Inequality and Dispersion Measures

Six complementary indicators were computed for each subject at each education level:

Measure	**Formula / Definition**	**Rationale**
Standard Deviation (SD)	$\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \bar{x})^2}$	Absolute dispersion in percentage point units
Interquartile Range (IQR)	$Q_3 - Q_1$	Robust spread, insensitive to extreme flexible-timetable values
Coefficient of Variation (CV)	$CV = \frac{\sigma}{\bar{x}} X\ 100$	Scale free relative dispersion; belongs to Generalized Entropy class (α= 2), enabling exact additive decomposition into between group and within-group components (Sorensen, 2002)
Gini Coefficient	$G = \frac{1}{N^2\bar{x}^2}\sum_{i=1}^{N}\sum_{j=1}^{N}\lvert x_i - x_j\rvert$	$x\_i - x\_j$
Median Absolute Deviation (MAD)	MAD = Median ($\lvert x_i - \tilde{x}\rvert$)	($\lvert x_i - \tilde{x}\rvert$
Inter-country Range	$max\ (x_i) - min\ (x_i)$	Extremes of policy discretion across countries

The coefficient of variation was selected as the principal relative measure because it is unit free, permits comparison across subjects with markedly different mean allocation shares, and owing to its membership in the Generalized Entropy family (parameter α =2) supports exact additive decomposition. This decomposability property aligns with the ex-ante equality of opportunity framework, in which total inequality can be partitioned into between group (circumstance) and within group (effort/idiosyncratic) components.

4.3 Composite Inequality Score

To integrate the six indicators into a single ranking, a composite inequality score was constructed as follows:

$$\text{Composite Score}_j = \frac{1}{6} \sum_{k=1}^{6} {}^{p}R_{K,j}$$

where $P\,R_{K,j}$ is the percentile rank of subject j on indicator k. A score of 1 indicates the subject with the highest overall inequality; a score approaching 0 indicates the most internationally standardised subject.

4.4 Analytical Procedure

All calculations were performed separately for ISCED 1 and ISCED 2/24 and for each curriculum subject. Aggregate level statistics (Table 1) summarise overall cross country heterogeneity at each education level. Subject level statistics (Table 3) provide the granular detail required to identify which domains drive dispersion. Composite rankings (Table 4; Figures 3 and 4) synthesise the multi indicator evidence. Line charts of CV and Gini by subject (Figures 1 and 2) visualise the dispersion hierarchy, while illustrative school level timetables (Figures 5–7) contextualise the OECD patterns against concrete national curriculum models.

5. Results

The document analyses cross country variation in compulsory instruction time allocation using OECD Education at a Glance data (Instruction Time per Subject by Level of Education). It focuses on ISCED 1 (Primary) and ISCED 2/24 (Lower secondary general education). Dispersion and inequality are measured with standard deviation (SD), interquartile range (IQR), coefficient of variation (CV), Gini coefficient, median absolute deviation (MAD), and inter-country range. A composite inequality score ranks subjects by combining percentile ranks of these indicators (equal weight; Rank 1 = highest inequality).

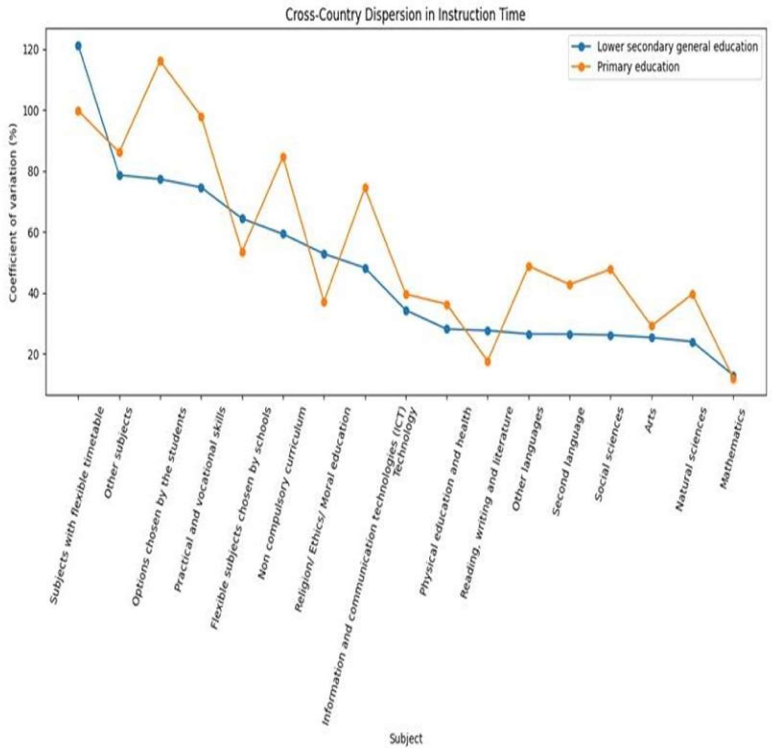

Figure 1. Cross-Country Dispersion in Instruction Time

5.1 Cross-Country Dispersion in Instruction Time

Line chart of CV (%) by subject for primary (orange) and lower secondary (blue). Subjects ordered roughly from high to low dispersion. Flexible timetable and options categories sit at the left (C V often > 80–120 %); mathematics sits at the far right (CV ≈ 12–13 %). Primary CV is frequently higher than lower-secondary CV, especially for flexible and optional categories.

Visually confirms that relative dispersion is largest for non-core, flexible elements and smallest for mathematics and literacy, with primary education generally more variable.

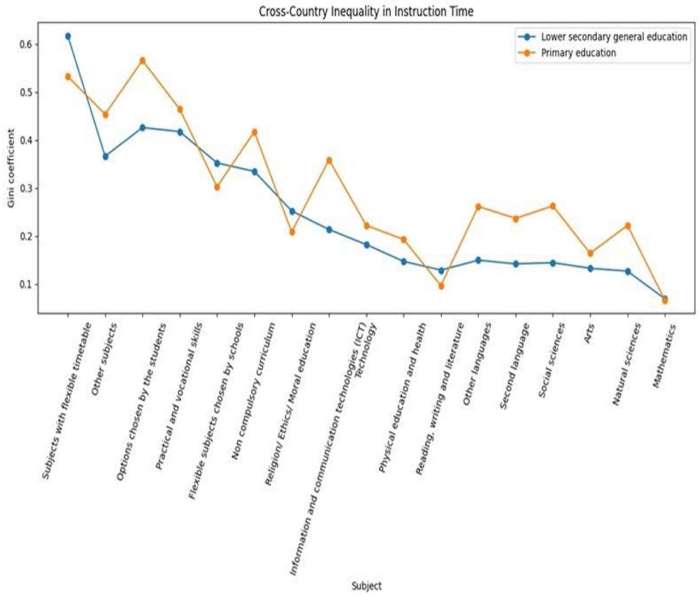

Figure 2. Cross-Country Dispersion in Inequality Time

5.2 Cross-Country Dispersion in Inequality Time (Gini)

Analogous line chart using Gini coefficients. Same ordering and colour scheme. Flexible categories reach Gini > 0.5–0.6; mathematics falls to ≈ 0.07. Primary Gini exceeds lower secondary Gini for most subjects.

Reinforces the CV pattern with an inequality lens: allocation percentages for flexible subjects are highly unequal across countries, while core subjects are distributed much more evenly.

The inequality and dispersion analysis has been completed using all valid OECD observations (OBS_STATUS = A, Normal value). The analysis was performed separately for Primary education and Lower secondary general education, and for each subject.

Overall results

Education level	N	SD	IQR	CV (%)	Gini	Inter-country range	MAD
Primary education	347	12.034	9.984	108.07	0.448	99.992	4.452
Lower secondary	395	7.637	7.689	78.26	0.333		3.909

Table 1. Overall results (aggregate dispersion metrics by education level)

• Primary (N = 347): SD = 12.034, IQR = 9.984, CV = 108.07%, Gini = 0.448, MAD = 4.452, inter country range ≈ 99.99.

• Lower secondary (N = 395): SD = 7.637, IQR = 7.689, CV = 78.26%, Gini = 0.333, MAD = 3.909 (range incomplete in text but later shown as ≈ 99.5).

Primary education shows substantially greater cross-country heterogeneity in how instructional time is allocated than lower secondary education. All relative and absolute dispersion measures are higher at the primary level, indicating more diverse national curriculum structures early in schooling.

5.3 Important subject-level findings

The largest dispersion is concentrated in flexible and optional curriculum categories.

• Lower secondary: *Subjects with flexible timetable* has *CV* = 121.23%, Gini = 0.618, and range = 98.76 percentage points.

• Primary: *Options chosen by the students* has *CV* = 116.04%, Gini = 0.566.

• *Subjects with flexible timetable* in primary education has Gini = 0.533 and *CV* = 99.73%.

• *Practical and vocational skills* also show substantial primary-level heterogeneity (*CV* = 97.96%).

• By contrast, Mathematics is highly consistent internationally: *CV* = 12.01% in primary and 13.01% in lower secondary, with Gini coefficients of 0.067 and 0.069, respectively.

• Reading, writing and literature are also comparatively consistent, particularly at the primary level (*CV* = 17.67%, Gini = 0.097).

This suggests that core subjects such as mathematics and literacy have relatively standardized instructional allocations, whereas flexible, optional, and vocational components vary substantially between education systems.

Education level	**Gini coefficient**	**Median Absolute Deviation (MAD)**	**Inter-country range**
Primary education	0.4477	4.4524	99.9919
Lower secondary general education	0.3331	3.9087	99.5080

Table 2. Selected inequality metrics (Gini, MAD, inter-country range)

• Primary: Gini 0.4477, MAD 4.4524, range 99.9919.

• Lower secondary: Gini 0.3331, MAD 3.9087, range 99.5080.

A companion summary of extremes is also given:

• Primary: min ≈ 0.008, max = 100, median ≈ 8.33.

• Lower secondary: min ≈ 0.492, max = 100, median ≈ 8.99.

The higher primary Gini confirms greater inequality in the distribution of percentage allocations. MAD differences are modest, showing that typical deviations from the median are only slightly larger at the primary level. The near 100 point ranges at both levels arise because some curriculum categories approach 0% in some countries and 100% in others, reflecting fundamentally different ways of organising flexible or residual time.

Gini coefficient: Primary education has a considerably higher Gini (0.4477) than lower secondary education (0.3331), indicating greater inequality in the distribution of instructional time percentages across countries at the primary level.

Median absolute deviation: The MAD is 4.4524 percentage points for primary education versus 3.9087 percentage points for lower secondary education. Thus, the typical country level deviation from the median is modestly greater in primary education.

Inter country range: Both education levels have an exceptionally wide range, approximately 100 percentage points. This results from observations close to 0% and 100%, indicating that some curriculum categories are allocated very differently across education systems.

Education level	Minimum	Maximum	Median
Primary	0.0081	100.0000	8.3333
Lower secondary	0.4920	100.0000	8.9942

5.4 Subject-level calculations

Detailed per-subject statistics (N, IQR, CV, Gini, MAD, range) appear twice once for lower secondary (top block) and once for primary (bottom block). Key extremes:

• Highest dispersion: “Subjects with flexible timetable” (lower secondary CV ≈ 121 %, Gini ≈ 0.618, range ≈ 98.8; primary CV ≈ 99.7 %, Gini ≈ 0.533, range ≈ 99.4) and “Options chosen by the students” (primary CV ≈ 116 %, Gini ≈ 0.566). Practical/vocational skills and non-compulsory curriculum also rank high.

• Lowest dispersion: Mathematics (primary CV ≈ 12.0 %, Gini ≈ 0.067; lower secondary CV ≈ 13.0 %, Gini ≈ 0.069) and Reading, writing and literature (especially primary CV ≈ 17.7 %, Gini ≈ 0.097).

Core academic subjects (mathematics, literacy) exhibit strong international standardisation. Flexible, optional, school chosen, student chosen, and vocational categories drive most of the observed cross country variation. This pattern holds at both education levels but is more pronounced in primary education for some optional categories

5.5 Subject-level Inequality Ranking – Primary Education

Horizontal bar chart of composite inequality scores (0–1 scale). Highest bars: subjects with flexible timetables, Non-compulsory curriculum, other subjects, Flexible subjects chosen by schools, and Practical and vocational skills. Lowest bar: Mathematics.

Primary level ranking mirrors the aggregate finding that optional and residual curriculum time is the main source of international difference; mathematics is the most standardised.

Subject	N	IQR	Coefficient of variation (%)	Gini coefficient	Median absolute deviation	Inter country range
Subjects with flexible timetable	7	48.805	121.2293	0.6179	4.5765	98.7626
Other subjects	19	2.5207	78.63	0.3664	1.0245	17.3432
Options chosen by the students	12	8.5959	77.2829	0.4261	3.7418	18.8816
Practical and vocational skills	16	5.9547	74.6062	0.4177	2.7587	10.6192
Flexible subjects chosen by schools	17	10.6416	64.3582	0.3523	3.0344	16.369
Non compulsory curriculum	11	13.2637	59.3047	0.3348	7.3019	27.1159
Religion/ Ethics/ Moral education	24	2.5515	52.8195	0.2523	1.0787	12.4348
ICT	18	0.9962	48.2246	0.2135	0.535	8.691
Technology	19	1.377	34.3415	0.1821	0.541	4.9055
Physical education and health	34	2.5812	28.1534	0.147	1.2655	12.4795
Reading, writing and literature	35	4.012	27.6882	0.1288	2.1455	23.4848
Other languages	16	2.3885	26.5305	0.1496	1.1745	6.0521
Second language	34	2.9866	26.488	0.142	1.5314	12.9188
Social sciences	34	4.3987	26.1875	0.1444	2.2996	13.191
Arts	31	1.7223	25.3607	0.1326	0.956	10
Natural sciences	33	2.6545	24.0244	0.1267	1.1282	13.5723
Mathematics	35	2.22	13.0116	0.0691	1.0636	8.8889
Options chosen by the students	6	3.3085	116.0393	0.5662	0.6864	10.6427
Subjects with flexible timetable	11	86.3119	99.735	0.5328	12.473	99.3778
Practical and vocational skills	13	3.8203	97.9593	0.4645	1.7186	15.5362
Other subjects	18	7.7062	86.0885	0.4538	3.5302	23.3818
Non compulsory curriculum	10	11.9721	84.6768	0.4175	6.5304	49.6203
ICT	11	1.487	74.4328	0.3591	0.8731	7.7365
Flexible subjects chosen by schools	14	6.8018	53.4555	0.3025	3.865	13.2807
Other languages	7	1.104	48.8012	0.2617	0.3416	1.8273
Social sciences	27	4.1755	47.7359	0.2626	2.3306	11.1294
Second language	33	3.1184	42.7849	0.2368	1.8011	13.1167
Natural sciences	32	4.0274	39.6014	0.2221	2.0509	11.8916
Technology	10	1.5491	39.5926	0.2221	0.8965	4.0682
Religion/ Ethics/ Moral education	25	3.0191	37.0723	0.2083	1.6031	8.3333
Physical education and health	33	2.6324	36.305	0.1929	1.3854	17.7409
Arts	31	4.6711	29.1829	0.1639	2.2036	14.6822
Reading, writing and literature	33	5.8785	17.6675	0.0965	3.1436	23.8889
Mathematics	33	2.5896	12.0125	0.0665	1.361	9.3651

Table 3. Subject-level calculations

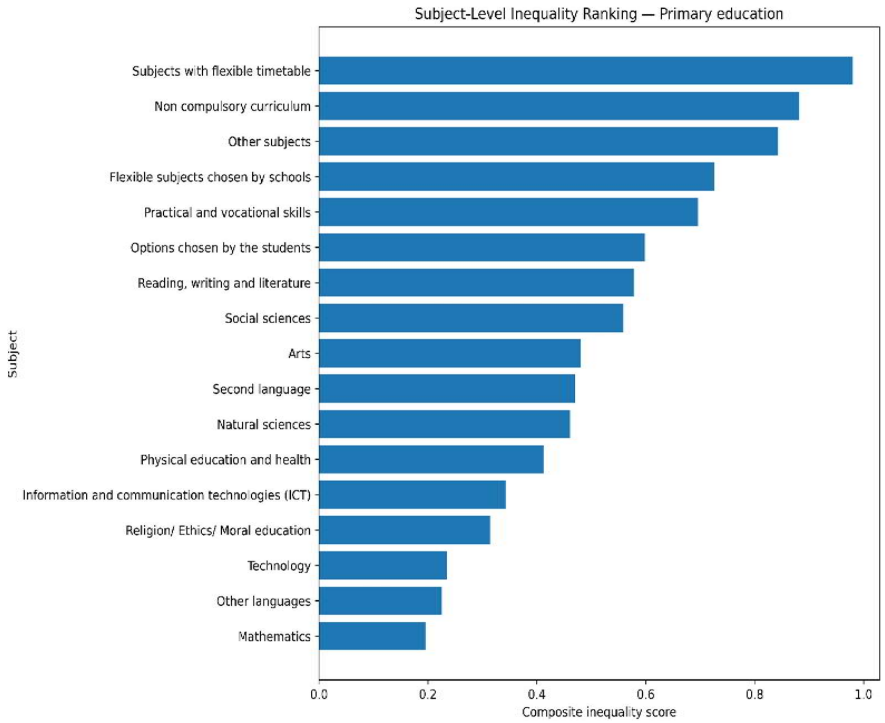

Figure 3. Subject-level inequality Ranking-Primary Education

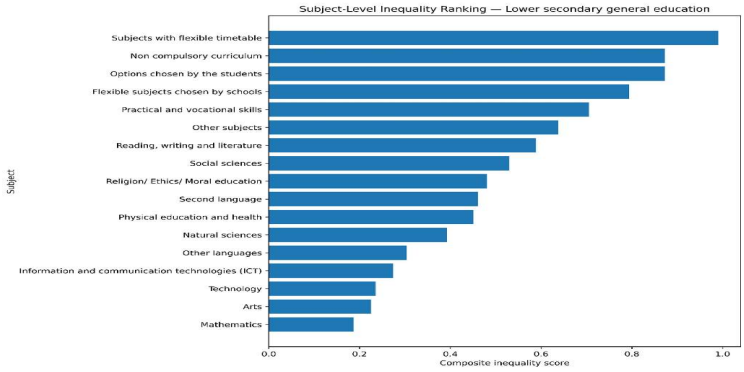

Figure 4. Subject-level inequality Ranking-Secondary General Education

5.6 Subject-level Inequality Ranking – Lower Secondary General Education

Identical format for lower secondary. Top: Subjects with flexible timetable, Non-compulsory curriculum, Options chosen by students, Flexible subjects chosen by schools, Practical and vocational skills. Bottom: Mathematics (lowest), followed by Arts and Technology.

The same hierarchical pattern appears at lower secondary, confirming that the flexibility versus core distinction is robust across both education stages.

A composite inequality score was calculated from the percentile ranks of these six indicators, giving each measure equal weight. Rank 1 = highest overall inequality/dispersion**.**

5.6.1. Lower-Secondary Education

Rank	Subject	Gini	MAD	Range	Composite score
1	Subjects with flexible timetable	0.6179	4.5765	98.7626	0.9902
2	Non-compulsory curriculum	0.3348	7.3019	27.1159	0.8725
3	Options chosen by students	0.4261	3.7418	18.8816	0.8725
4	Flexible subjects chosen by schools	0.3523	3.0344	16.3690	0.7941
5	Practical and vocational skills	0.4177	2.7587	10.6192	0.7059
…	…	…	…	…	…
13	Other languages	0.1496	1.1745	6.0521	0.3039
14	ICT	0.2135	0.5350	8.6910	0.2745
15	Technology	0.1821	0.5410	4.9055	0.2353
16	Arts	0.1326	0.9560	10.0000	0.2255
17	Mathematics	0.0691	1.0636	8.8889	0.1863

Table 4. Composite Inequality Score

Ranks subjects by a composite score derived from percentile ranks of the dispersion indicators. Top ranks are as follows:

1. Subjects with flexible timetable (composite ≈ 0.990; Gini 0.618, range H" 98.8). 2–3. Non-compulsory curriculum and Options chosen by students (both H" 0.873). 4–5. Flexible subjects chosen by schools and Practical/vocational skills. Bottom ranks: Technology, Arts, and especially Mathematics (composite H" 0.186; Gini 0.069).

The ranking crystallises the contrast between highly variable "flexibility" components and tightly constrained core subjects. Mathematics is the most internationally consistent category under this multi-indicator metric. The lower secondary results show a very strong contrast between flexibility oriented curriculum components and core academic subjects.

Subjects with flexible timetables are by far the most unequal category, with a Gini coefficient of 0.6179 and an inter country range of almost 99 percentage points.

At the opposite extreme, Mathematics has the lowest composite inequality score and a very low Gini coefficient (0.0691), indicating comparatively strong international consistency.

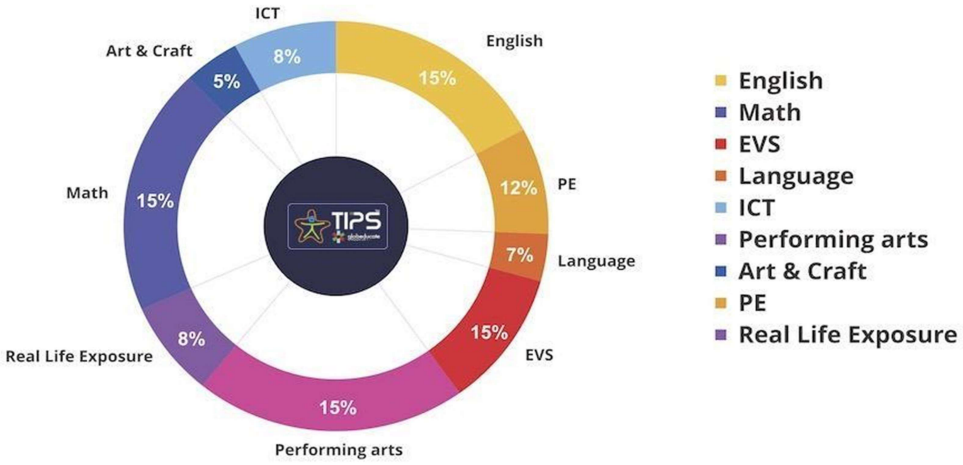

Figure 5. Donut/pie chart of a specific school's curriculum time allocation (TIPS Global School branding)

Segments include English 15%, Math 15%, EVS 15%, Performing arts 15%, PE 12%, Language 7%, ICT 8%, Art & Craft 5%, Real Life Exposure 8%.

Illustrative example of a concrete, relatively balanced primary/early curriculum that still allocates substantial shares to arts, PE and "real life" components areas that the OECD data show vary widely across countries.

Years 7 and 8 (Key Stage 3 Foundation): Column diagram of weekly hours for a typical lower-secondary timetable: Core (English 3, Maths 3, Science 3, Reading 1), Languages (French 2), Humanities (Geography 2, History 2, Religious Studies 1), Arts (Art/Drama/Music 1 each), Technologies (Computer Science, Food, Design 1 each), PE (Core PE 2).

Concrete example of a structured lower-secondary week. Core academic subjects receive the largest blocks, while arts, technologies and PE occupy smaller, more modular slots consistent with the OECD finding that core subjects are more standardised and flexible/optional elements more variable.

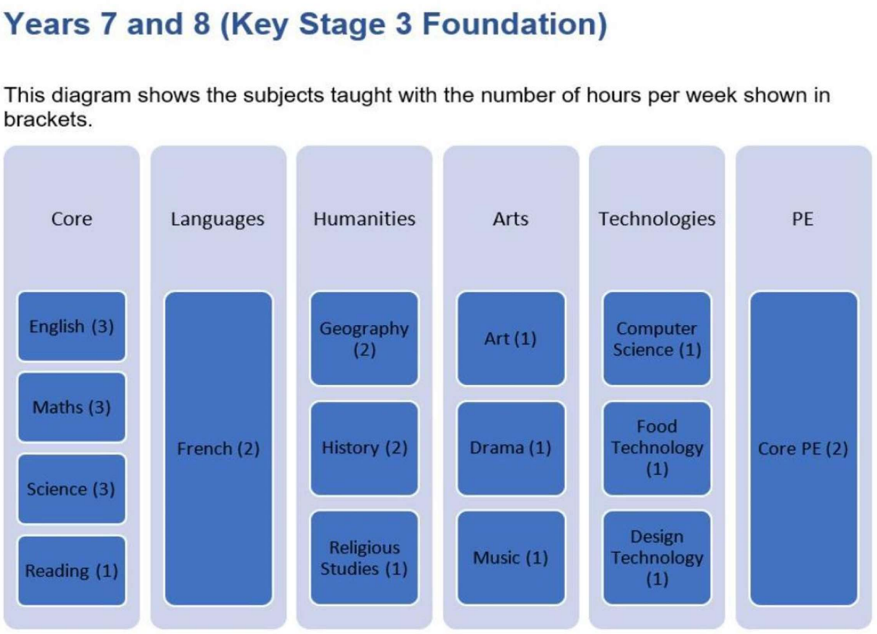

Figure 6. Years 7 and 8 (Key Stage 3 Foundation)

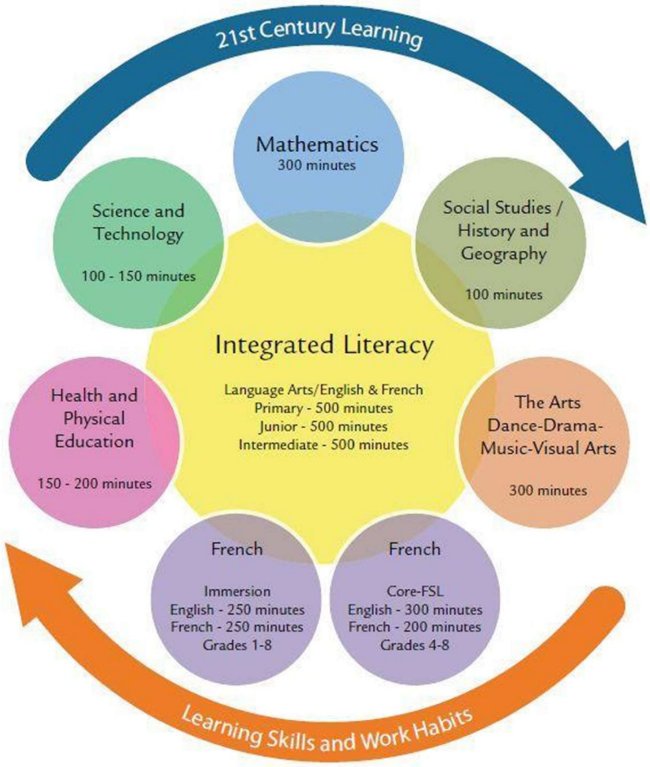

Figure 7. Circular "21st Century Learning" diagram centred on Integrated Literacy (Language Arts/English & French, 500 minutes at different stages)

Surrounding subjects with minute allocations: Mathematics 300, Social Studies/History & Geography 100, The Arts 300, Science and Technology 100–150, Health and Physical Education 150–200, plus French Immersion and Core-FSL options. Outer arcs label "21st Century Learning" and "Learning Skills and Work Habits."

Another concrete curriculum model emphasising integrated literacy at the centre and balanced allocation across STEM, arts, health and languages. The explicit minute ranges and dual French pathways illustrate the kind of system level choices that produce the high cross country dispersion observed for languages, arts and flexible categories in the OECD data.

6. Discussion

6.1 Principal Findings in Context

The results reveal a pronounced and consistent hierarchy of cross country inequality in compulsory instruction time across OECD education systems. Three findings merit particular emphasis.

First, primary education exhibits substantially greater cross country heterogeneity than lower secondary education. Every aggregate indicator SD (12.03 vs 7.64), IQR (9.98 vs 7.69), CV (108.07% vs 78.26%), Gini (0.448 vs 0.333), and MAD (4.45 vs 3.91) is higher at ISCED 1. This suggests that national authorities exercise wider discretion over primary curricula, whereas lower secondary structures are more tightly regulated, possibly because they feed into standardised examination systems and upper secondary tracking decisions. The finding resonates with Schnepf's [22] observation that instruction time policy interacts with the degree of centralisation and tracking in each system.

Second, the dispersion hierarchy is sharply bifurcated between "flexibility" categories and "core academic" subjects. At both education levels, Subjects with Flexible Timetable, Options Chosen by Students, Non-compulsory Curriculum, Flexible Subjects Chosen by Schools, and Practical/Vocational Skills occupy the top ranks of the composite inequality score (composite scores ranging from approximately 0.70 to 0.99). By contrast, Mathematics and Reading, Writing and Literature consistently occupy the bottom ranks (composite scores of 0.19 and 0.23, respectively, at lower secondary). The Gini coefficients encapsulate this contrast starkly: 0.618 for Subjects with Flexible Timetable at lower secondary versus 0.069 for Mathematics. This pattern indicates that international convergence is strongest where a subject is universally regarded as foundational, while policy discretion and hence inequality is concentrated in the residual, optional, and vocationally oriented components of the timetable.

Third, the near 100 percentage point inter country ranges observed for flexible categories reflect fundamentally different national philosophies of curriculum design. In some systems, a "flexible timetable" category may absorb a large share of the school week, while in others it is effectively zero. The inter country range of 98.76 percentage points for Subjects with Flexible Timetable at lower secondary, and 99.38 at primary, is not merely statistical noise; it captures genuine structural divergence in how countries balance prescribed content against school level or student level choice. The illustrative timetables in Figures 5–7 underscore this point: one school allocates 15% each to English, Mathematics, and Environmental Studies alongside substantial arts and "real life exposure" blocks, while a Key Stage 3 model concentrates hours in core English, Mathematics, and Science with modular arts and technology slots.

6.2 Interpretation through the Equality of Opportunity Lens

The exante equality of opportunity framework (Checchi & Peragine, 2010; Van de Gaer, 1993) distinguishes inequality attributable to circumstances factors beyond the individual's control from inequality attributable to effort. Applied to instruction time, the country and curriculum category in which a child is enrolled constitute circumstances: they are determined by geography, policy, and institutional design rather than by the pupil's choices. The high between group dispersion observed for flexible and optional categories therefore represents a form of *circumstance driven* inequality: two equally motivated pupils in different OECD countries may receive radically different quantities of compulsory instruction in, for example, vocational skills or student-chosen options, purely because of the system in which they are enrolled.

The low dispersion of Mathematics and literacy, by contrast, suggests that OECD systems converge on a shared minimum of core academic exposure, which can be interpreted as a partial equaliser of opportunity. The coefficient of variation's additive decomposability (Sorensen, 2002) would permit a formal between group / within group partition in future work, quantifying precisely how much of total instruction time inequality is attributable to country level policy choices versus within country subject level variation.

6.3 Policy Implications

The findings carry several implications for education policy and comparative analysis:

• Curriculum transparency and benchmarking. The high dispersion in flexible and optional categories suggests that cross country comparisons of learning outcomes (e.g., PISA, TIMSS) should account for differences in the *quantity* of instruction time, not merely its quality. Countries allocating substantially more compulsory hours to a domain may enjoy a mechanical advantage in related assessments.

• Equity monitoring. The composite inequality ranking developed here could be adapted as a monitoring tool for international organisations seeking to track convergence or divergence in curricular inputs over successive EAG cycles.

• National policy review. Countries at the extremes of the distribution for example, those allocating near zero or near total shares to flexible categories may wish to assess whether their allocations reflect deliberate pedagogical strategy or legacy institutional arrangements.

• Primary level attention**.** Because primary education shows greater dispersion overall, policy dialogue at the ISCED 1 level may benefit from more explicit international guidance on minimum instructional allocations, particularly for subjects such as ICT, Technology, and Practical/Vocational Skills where variation is large.

6.4 Limitations

Several limitations should be acknowledged. First, the analysis treats each country as a single observation, thereby masking sub national (regional, state, or municipal) variation that may be substantial in decentralised systems. The geographical inequality literature (Shorrocks & Wan, 2005; Modrego & Berdegué, 2015; Achten & Lessmann, 2020) suggests that within country territorial disparities could amplify the cross country patterns documented here. Second, the dataset records *compulsory* instruction time as defined by national regulations; actual delivered hours may differ owing to teacher autonomy, school level flexibility, or informal curriculum adjustments. Third, the composite inequality score employs equal weighting across six indicators; alternative weighting schemes (e.g., principal component weights) could marginally alter the ranking. Fourth, the sample sizes for some subjects are small (e.g., N = 6 for Options Chosen by Students at primary; N = 7 for Subjects with Flexible Timetable at lower secondary), which limits the robustness of dispersion estimates for those categories. Fifth, the cross sectional design precludes analysis of temporal trends in convergence or divergence.

6.5 Directions for Future Research

The decomposability of the coefficient of variation invites a formal between group/ within group decomposition of instruction time inequality, where groups might be defined by curriculum category, by OECD region, or by income cluster. Extending the analysis to upper secondary (ISCED 3) and to total instructional hours (rather than percentage shares) would provide a more complete picture of temporal inequality across the full span of compulsory education. Longitudinal replication using successive EAG editions would reveal whether OECD systems are converging or diverging over time. Finally, linking instruction time dispersion to student-level outcome data (e.g., PISA scores by subject domain) would allow researchers to test whether cross-country differences in curricular time allocation translate into measurable differences in learning outcomes, thereby closing the loop between structural inequality and educational achievement.

6.6 Concluding Remarks

This study demonstrates that compulsory instruction time is far from uniformly distributed across OECD education systems. The dispersion is highly structured: core academic subjects Mathematics and literacy

above all exhibit remarkable international consistency, while flexible, optional, and vocationally oriented components of the curriculum vary enormously from country to country. Primary education is more heterogeneous than lower secondary education on every indicator examined. These patterns are robust across six complementary dispersion and inequality measures and are captured parsimoniously by the composite inequality ranking. The findings underscore that instruction time policy is a significant, yet under studied, dimension of educational inequality and that its cross country structure warrants systematic monitoring within the broader agenda of reducing inequalities in human development.

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