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Evaluate the education system and analyze the possible solutions

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Abstract: Education has always been a topic that every family and even the country attach importance to, and each country has formed its own educational system structure, each with its own strengths. In this global common challenge, the new crown epidemic, some countries' educational system structure exposed some criticism, while some countries are very useful. In order to realize the globalization of education and realize the goal of cultivating talents together, we hope to evaluate the health degree of education system by establishing an evaluation model of educational system structure. For those who do not meet the requirements of healthy and sustainable development, the corresponding policies are analyzed and predicted.

1. Introduction

Descartes, a famous mathematician, once said:" my efforts to study have no other benefits, but more and more aware of their ignorance "can see the importance of learning to a person; Confucius, a Confucian educator, once put forward the idea of" teaching without class ", which can be seen in the education system. Throughout the world, the importance of education seems to have reached a consensus, so how to establish a healthy education system has become a global problem worth thinking about.

Looking around the world, the structure of the education system adopted by each country seems to have its own characteristics. Each country not only trains its own students, but also attracts a large number of overseas students.

In the special year of 2020, the world is faced with the great challenge of the new crown epidemic. In many countries, the educational system structure of the new crown epidemic has exposed some problems and is worth learning from. This requires us to think together about how to assess the health status of a country's educational system structure and propose policies to promote change to make the current structure move forward like the designated health system structure and better achieve the common progress of global education.

2. Macro-assessments of Higher Education System Based on Cluster Thought

Use K-Means cluster analysis to classify the current level of higher education in a country.

K-means algorithm is an iterative cluster analysis algorithm, whose steps are as follows:

Step1 Specify the number of clusters to be partitioned K;

Step2 Randomly select K data object as the initial cluster center;

Step3 Calculate the distance from the remaining data objects to the K clustering centers. Classify the data object into the cluster near its nearest center;

Step4 Modulation of new clusters and recalculation of the centers of each new cluster;

Step5 Cycle adjustment Step3 and Step4 to see if the center converges. If it converges or reaches the number of iterations, stop the loop.

Means++ algorithm is an improvement of the K-means algorithm, which improves the step of K-means" initializing K clustering centers". The principle of selecting the initial cluster center is that the initial cluster center should be as far away as possible. K-means++ algorithm flow chart is shown in Figure 2. On question 1, in order to classify the structure of higher education systems in the world's major countries, we collate the data obtained and divide them into four levels: complete, excellent, ordinary and backward in the quality of education, clustering the relevant data in each country using K-means++ algorithms to select the appropriate K values at each stage, and combining the impact on the education system during the epidemic period with the impact on the education system in the country during that period, the education system fluctuates less, the education system receives fluctuations, and the education system is destroyed. By dividing the epidemic into the first, the middle, the last and the last four periods to judge the categories of each country, we can sum up the final classification scheme, and analyze the degree of influence of the educational system structure on each country and judge its advantages and disadvantages.

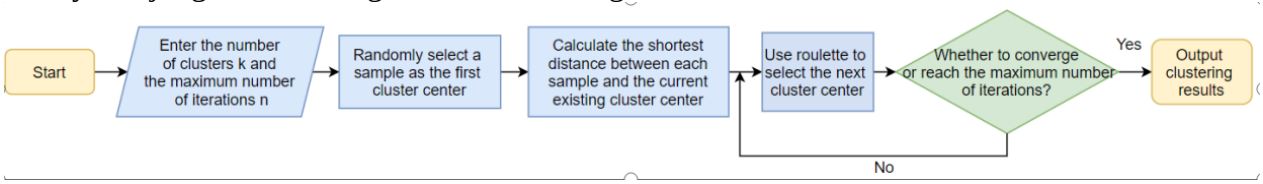

Figure 1: K-Means++ algorithm flow chart

We will collect the data of the time series of education quality in the world's major countries (including the growth rate of students in the country's colleges and universities, the increase in the number of colleges and universities in that year, the expansion of the size of teachers in that year, and the scientific research output in that year). We have selected 19 countries with complete data and certain representative data for further processing. According to the actual background, because the number of population and the level of economic development are different in different countries, the increase is not as accurate as the ratio. In order to avoid the influence of scientific research innovation and teachers' strength, we take the difference between the increase of scientific research output and the input of teacher scale as the index to measure the economic benefit of the national education system. The following steps are taken to establish the model of institutions of higher learning in different countries:

The data obtained by the query are shown in the following table:

Table 1: Tables of indicators of higher education levels in each country

	Number of students in colleges and universities	Number of institutions of higher learning	Educational capital investment (10 billion US dollars)	Technology product output (10 billion US dollars)	Faculty ratio (Stud
America	5753	3600	1311.2	1990.92	28
China	2040	2956	818.33	1247.12	36.7
Australia	1102	420	1152.2	1598.29	22.49
England	1021	792	1096.85	1333.52	31.69
Canada	975	98	1024.33	1382.17	38
France	850	114	997	1104.15	36.58
Netherlands	646	72	905.25	1063.22	36.7
Germany	641	315	826.04	1012.11	28.78
Japan	638	764	789.25	962.34	29.86
Korean	620	415	702.8	866.32	35.2
Denmark	556	318	699.11	853.12	27.86
Norway	534	575	685.23	811.85	58.44
Spain	533	583	612.35	757.23	26.66
Russia	526	1249	573.25	895.65	40.8
Finland	514	437	565.23	765.22	39.16
Israel	444	339	512.85	758.78	32.88
Portugal	368	289	544.32	722.15	46.5
Belgium	334	221	241.23	492.17	29.26
Malaysia	332	175	35.67	71.36	43.76

Step1 The data will be cleaned, considering the integrity of the data and the typical development of higher education, 19 countries are selected for subsequent analysis. Considering the integrity of the data of each country, we select the data from 2016 to 2020 as a sample, and divide the four-year development into the early, middle, late and late stages of the development of the corresponding national education system structure in one year.

Step2 Pre-processing data in time periods for 20 major countries using Python pandas and numpy databases, the number of new students (NSN), new institutions of higher learning (NCN), scientific research output increment-teacher input (AEE) were calculated in each country during this period of time).

Step3 In four time periods, the SPSS 24 is clustered according to the number of students in new institutions of higher learning (NSN) and new institutions of higher learning (NCN) in each country, and set K=4. The four categories obtained in each period correspond to the rapid development of the quality of education in the country during that period, the steady growth of the quality of education, the slow development of the quality of education, the stagnation or decline of the quality of education. The categories of different countries in the four time periods are summarized (the categories of countries in each time period are shown in Figure (3)). Artificial delineation of appropriate indicators to determine the quality of education development characteristics of the final national classification.

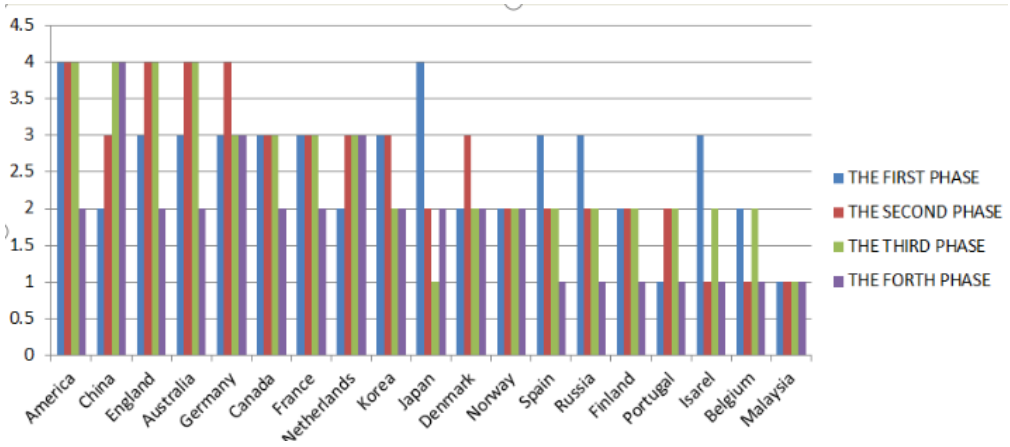

Figure 2: Clustering of countries on the economic contribution of higher education in each country within a given time frame

Note: Category 4 indicates that the economic productivity of institutions of higher learning in the country was very high during the period; Category 3 indicates that the economic productivity of institutions of higher learning during the period was considerable; Category 2 indicates that the economic productivity of institutions of higher learning during the period was stable; Category 1 indicates that the economic earnings of institutions of higher learning during the period were low.

3. Results

① First of all, from the level of higher education development, the two dimensions of development level and stability are analyzed, and the four stages of the study are divided into four years, and a table of 3×3 is obtained.

② From the point of view of economic output, the output of countries with high quality education is relatively high, which can produce more scientific research output. In 2020, the overall level of decline (which is closely related to the global economic decline caused by the new crown virus), through this classification, we have a macro understanding of the overall level of higher education development in each country.

Development status / Stable situation	high-level	low-level
stable	America、China England、Australia Germany、Canada France、Netherlands Korea、Japan Denmark、Norway	Spain、Russia Finland、Israel Portugal、Belgium Vietnam
fluctuation	China、America France、Korean Denmark、Norway Russia、Finland	England、Australia Canada、Netherlands Germany、Japan Spain、Portugal Israel、Belgium Malaysia

Figure 3: Outcome discussion on the level of higher education development in each country

4. Conclusion

Combined with the model obtained on the evaluation of the country, select the low level of the system structure of the country, combined with the current local development and geographical characteristics, according to local conditions to improve the higher education system structure, Combined with the promotion or blocking of its target factors, the final generation time trend.

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