Inequality of Educational Opportunities and Digital Literacy of School-Age Children in Sumatra

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A B S T R A C T

Inequality of educational opportunities is at the root of economic problems. Educational attainment will be a basic element in generating income, which will improve the quality and well-being of every child in the future. This study aims to look at the inequality of educational opportunities and the impact of digital literacy of school-age children on the inequality of educational opportunities in Sumatra. The results of the calculation show that there is an inequality of educational opportunities in Sumatra. Riau islands and Lampung provinces have the most ideal conditions where the inequality of education opportunities of low school age children and digital literacy of children is high. While the provinces of North Sumatra and South Sumatra have the least ideal conditions, the inequality of educational opportunities of high school-age children and digital literacy of children is low.

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INTRODUCTION

Education is the basis for improving human resources and the formation of superior generations makes it a major factor in socioeconomic growth and development. Education is so important that it becomes one of the Sustainable Development Goals (SDGs), which is to "ensure an inclusive and equitable quality of education and increase lifelong learning opportunities for all". In rpjmn 2015-2019 education is also listed in the development challenges, one of which is reducing the educational participation gap between socio-economic groups, between regions and between genders.

The difference in educational attainment gained from individuals when they get the same opportunity creates gaps between individuals. This condition is called *Inequality of Educational Opportunity* (IEO), where individuals get different education, (influenced by parental resources and other factors, when access to opportunities and treatment they get is the same (Shavit & Muller, 1998; Treiman & Yep, 1989). Boudon (1974) first came up with the theory of educational opportunity inequality. According to him, IEO arises from differences in the level of educational attainment influenced by socioeconomic background. The results showed a decrease in educational opportunity inequality and an increase in the average level of educational attainment when the level of industrial society increased. Some other literature also uses educational attainment variables and state variables to calculate educational opportunity inequality. These state variables are exogenous or out-of-control variables of the individual, such as social,economic and other. Hertz, Jayasundera, Piraino, Selcuk, Smith, & Verashchagina (2008) measures the inequality of educational opportunities using old education(*years of schooling*)school-age children and parental education. Benaabdelaali, Hanchane & Kamal (2012) uses

old school, age, gender. Rizk & Hawash (2020) uses old-school, religious and parental education variables to measure the ability of educational opportunities. Gamboa & Londono (2015) uses gender variables, parent's highest education, school type and school location using variance parametric analysis techniques. The results show that institutionally, income inequality has driven the segmentation of the education market so that school choice is used to find socioeconomic segments. Any policy designed to reduce inequality in primary and secondary education should take into account parental prefensi and the structure of education provision.

The latest calculation technique in the calculation of educational opportunity inequality was put forward by Ferreira & Gignoux (2013), using variance parametric analysis. Ferreira & Gignoux (2013) uses variables of educational attainment and circumstance characteristics (such as: location of residence, gender, parental education, race, book ownership, ownership of valuables, language used, culture used and migration status) which are then regressed using *Ordinary Least Square* (OLS) regression.

In Indonesia, the development of education is still a problem. School participation between levels of education still varies between levels of education, such as provinces on the island of Sumatra (BPS, 2018). The effectiveness of educational programs in absorbing educational potential is reflected in school participation. In urban areas, the Gross Enrollment Rate (APK) in Sumatra Island at SD / equivalent ranges from 106.89 percent to 114.37 percent, SMP / equivalent is between 89.73 percent to 100.48 percent, SMA / equivalent is between 87.52 percent and 98.10 percent. At the junior high / equivalent and high school / equivalent levels, the majority of these figures have still not reached the Ministry of Education and Culture's reinstra target of 100 percent.

In rural areas, the Gross Enrollment Rate (APK) in Sumatra Island at SD / equivalent ranges from 108.20 percent to 114.77 percent, SMP / equivalent is between 83.83 percent to 98.82 percent, SMA / equivalent is between 69.59 percent and 94.39 percent. The data shows that there is an inequality in GER between education levels. This is due to the existence of a public policy program from the government in the form of the Smart Indonesia Program (PIP) in the form of a 12 year compulsory education which has not been running optimally. The target for dropout rates in the Ministry of Education and Culture's strategic plan has not yet been achieved, which is one percent at each level of education. The dropout rate in Sumatra in 2018 at the SMP / equivalent level is between 0.75 percent to 2.91 percent and SMA / equivalent is between 0.87 percent to 6.23. This figure is greater than the national dropout rate of only 1.67 percent and 2.94 percent at SMP / equivalent and SMA / equivalent. The average length of schooling for school-age children in Sumatra has also not reached the government's target, which is between 8.24 years and 10.01 years.

Education is also very relevant to the process of production, technological advancement and economic growth (Lucas, 1988; Nelson & Phelps, 1966; Romer, 1990). Advances in Communication Technology and Information(ICT) enhance the substantive freedom of individuals to pursue their goals such as maintaining social relationships and seeking whatever information is needed. Machin, et al (2007) in (Slechtova, 2015) found that ICT has a positive effect in improving the performance of elementary school students. (Comi et al., 2017) also suggests that the use of ICT is able to improve the performance of grade 10 students and students' awareness in the learning process. BPS stated that the progress of ICT is sometimes a *digital divide*, uneven use of internet access, good telephone service and the presence of computer technology in all walks of life.

Spieza (2011) uses computer usage variables and science score values using econometrics methods. The results showed that there was a positive relationship between computer use and student score scores. This shows that there is effectiveness in education policy to use computers as a means of learning. Liao, Chang, Wang & Sun (2016) used the characteristics of schoolchildren, family backgrounds, in elementary and junior high schools to find out students' digital literacy. The results showed that home computer ownership, internet connectivity at home, maternal education had an effect on students' digital literacy.

Inequality of educational opportunities and digital literacy is considered an interconnected economic problem. This problem needs to be considered because it will have an impact on the growth of human resources that will ultimately hinder the economic growth of a region. The lack of research that examines the inequality of educational opportunities and digital literacy, especially in school-age children, is the basis of this research. This study aims to look at the inequality of educational opportunities and digital literacy of school-age children, especially in Sumatra Island.

The presentation in this study is divided into the first introduction, research methods and discussions that discuss the inequality of educational opportunities of school-age children, digital literacy of school-age children and the relationship between the two. This research will provide an overview and policy for decision makers to improve educational problems that will later become solutions to economic problems.

METHODOLOGY

Previous literature used parametric analysis (Ferreira & Gignoux, 2013) to measure educational opportunity inequality. Educational opportunity inequality is

calculated using an *inter-type* or *ex-ante* component approach (Ferreira & Gignoux, 2013),and (Song & Zhou, 2019) which uses state set variables that are exogenous variables beyond individual control. Roemer (2015), the inequality of opportunity indicates a conditional distribution of educational attainment that must be affected by variable circumstances. Ferreira & Gignoux (2013) performed the calculation of *Ordinary Least Square* (OLS) regression, with educational attainment (e.ance: old school) as dependent variables (y) and independent variables (state variables,), including: gender, the highest education of the head of the family, education funding assistance from the government (PIP subsidy). So that it can be formulated:

$$y_i = C_i' \beta + \varepsilon_i$$

Based on the regression Ferreira & Gignoux (2013) used it to measure educational opportunity inequality through a total variance proportion, described by the state variable. With the formula:

$$\hat{\theta}_{IOP} = \frac{Var\ (C_i, \hat{\beta})}{Var\ (y_i)}$$

Where is the OLS estimator of the equation (2). This value can be simplified by looking at the coefficient of determination $(R^2)$of the estimated equation (1).

This estimate of educational opportunity inequality (Ferreira & Gignoux, 2013) has advantages over other methods. First, the calculation uses OLS regression of educational attainment on a set of individual state variables. Second, it has a simple interpretation because the lower limit (coefficient of determination is not reduced by adding variables) of the inequality part of the opportunity in total inequality because $0 \le R2 \le 1$, where 0 represents the equation perfectly and 1 represents the total chance of inequality.

The calculation of digital literacy is done by categorizing variables. Barrantes (2007) grouped them into tabel 1. Further measurement of digital literacy index measured (Barrantes, 2007):

$$DigL = \frac{N_{DigL}}{N}$$

where DigL is Digital literacy index, N(DigL) is Number of digitally capable populations (categories 2 & 3), N is Total population

This study uses secondary data from the National Socioeconomic Survey (SUSENAS) in 2018 sourced from the Central Bureau of Statistics (BPS). This data is used because it is the latest data published by BPS. The scope of the data used in this study is for children aged 12-18 years because at this age the dropout rate and the child's gross participation rate

Tabel 1.
Classification of Digital Literacy Level Criteria for Individuals

Category	TV set ownership	Tlp/HP Ownership	Use of Internet of Access	Ownership and Use of Computers/Laptops and Internet at home
0. Not Extreme Digital Literacy	√			
1. Not Digital Literacy	√	√		
2. Communicative/Connected Individuals	√	√	√	
3. Digital Literacy	√	√	√	√

Source: Barrantes, 2007

still have not reached the target of reinstra kemendikbud which requires 12 years of study. This research is limited to the island of Sumatra.

In calculating educational opportunity inequality, the study used old school variables as dependent variables and gender variables, PIP subsidies, the highest education of household heads and household expenditures as independent variables through the regression of Ordinary Least Square (OLS). Furthermore, this study grouped digital literacy based on variables of TV ownership, HP/Tlp ownership and its use, internet access usage and computer/laptop ownership and usage.

RESULTS AND DISCUSSION

The discussion outlines the inequality of educational opportunities for school-age children according to the provinces on the island of Sumatra. The results showed that there was an inequality of educational opportunities in Sumatra.

The results of the calculations using ordinary least square (OLS) regression analysis are performed per province. Table 2 shows that per capita expenditure, the highest education of households and genders significantly affects the length of school age of 12-18 year olds in Sumatra in 1%. PIP subsidy has no significant effect on the length of school, meaning that PIP subsidy

in Sumatra Island does not effectively affect the length of school age children 12-18 years. According to the Province, per capita expenditure has a significant positive effect on the length of school in all provinces of Sumatra 1%, meaning that the greater the per capita expenditure the longer the schooling of children aged 12-18 years. The highest education of household heads has a significant positive effect on 1% except in Riau Islands Province, meaning the higher the education of parents, the longer the school of children aged 12-18 years. Gender has a significant negative effect on 1% except in Riau Islands Province, meaning girls tend to have greater school time than boys at school age 12-18 years.

In Table 3, it is shown that the index of inequality of opportunities for school-age children 12-18 years old in Sumatra is 0.013 to 0.048, a considerable range of values. The index of inequality of children's educational opportunities in general in Sumatra is 0.025. West Sumatra province has the highest index of educational opportunity inequality in Sumatra Island, while Riau Islands Province has the lowest educational opportunity inequality index.

In Figure 1, The Province of Riau Islands, Aceh and Lampung has an inequality index of educational opportunities of 0.013; 0.014; 0.022, below the index of inequality of education opportunities in

Tabel 2.
Ordinary Least Square (OLS) Regression Output Results

Variabel	Aceh	Sumatera Utara	Sumatera Barat	Riau	Jambi	Sumatera Selatan	Bengkulu	Lampung	Kep. Bangka Belitung	Kep. Riau	SUMATERA
Jenis Kelamin	-0.154 ***	-0.178 ***	-0.457 ***	-0.191 ***	-0.211 **	-0.363 ***	-0.338 ***	-0.321 ***	-0.421 ***	-0.139	-0.259 ***
	0.059	0.041	0.064	0.070	0.084	0.066	0.089	0.071	0.113	0.106	0.021
Subsidi PIP	-0.220 ***	-0.074	0.069	-0.063	0.085	0.117	-0.162	0.025	0.244	-0.028	-0.027
	0.069	0.051	0.079	0.103	0.122	0.086	0.115	0.087	0.190	0.156	0.027
Pendidikan Tertinggi Kepala Rumah Tangga	0.087 ***	0.135 ***	0.157 ***	0.144 ***	0.153 **	0.171 **	0.133 ***	0.069 **	0.234 ***	0.044	0.148 ***
	0.027	0.018	0.026	0.031	0.037	0.029	0.039	0.031	0.048	0.044	0.009
Log-Pengeluaran per Kapita	0.628 ***	1.148 ***	1.566 ***	1.122 ***	1.200 ***	1.250 **	0.800 ***	1.043 ***	1.423 ***	0.864 ***	0.939 ***
	0.140	0.103	0.160	0.165	0.191	0.139	0.199	0.161	0.306	0.233	0.049
Jumlah Observasi	5589	11338	5149	3885	2817	4664	2315	3760	1620	1620	42757
R-squared	0.014	0.027	0.048	0.028	0.031	0.040	0.028	0.022	0.046	0.013	0.025

***; **, * significant 1%; 5%; 10%

Blue text indicates the default error value

Source: BPS, 2018 (Processed by Author)
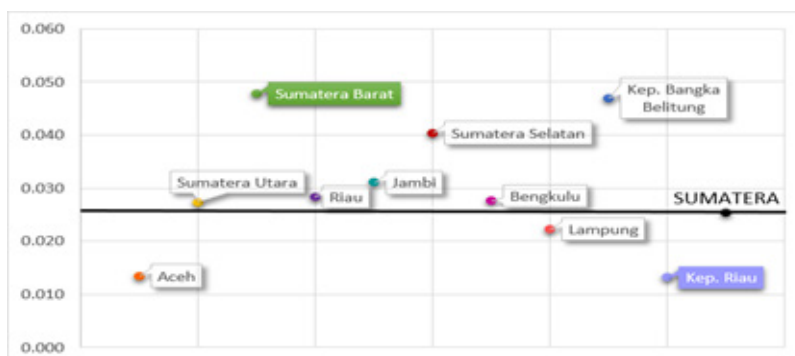
Source: BPS, 2018 (Processed by Author)

Figure 1.
Spreading Inequality of School-Age Children's Educational Opportunities by Province in Sumatra

general in Sumatra of 0.025. Meanwhile, The provinces of West Sumatra, Bangka Belitung Islands, South Sumatra, Jambi, Riau, Bengkulu and North Sumatra have inequality above the index of educational opportunity inequality in Sumatra, amounting to 0.048; 0.047; 0.040; 0.031; 0.028; 0.028 and 0.027. This condition shows that 3 provinces are more evenly distributed educational opportunities of their children than 7 other provinces.

Advances in digital technology require school-age children to have digital literacy. Digital literacy skills that children have in school are very helpful in achieving the child's goal of getting an ideal education and according to their age. Table 3 shows that the digital literacy index in Sumatra island is between 0.247 to 0.472. There is a digital literacy gap between provinces in Sumatra.

Tabel 3.
Index of Inequality of Educational Opportunities for School-Age Children in Sumatra

№	Province	IEO	Number of Observations
1	Aceh	0.014	5589
2	North Sumatra	0.027	11338
3	West Sumatra	0.048	5149
4	Riau	0.028	3885
5	Jambi	0.031	2817
6	South Sumatra	0.040	4664
7	Bengkulu	0.028	2315
8	Lampung	0.022	3760
9	Kep. Bangka Belitung	0.047	1620
10	Kep. Riau	0.013	1620
	Sumatra	**0.025**	**42757**

Source: BPS, 2018 (Processed by Author)

Table 4.
Value of School-Age Children's Digital Literacy Index by Province in Sumatra

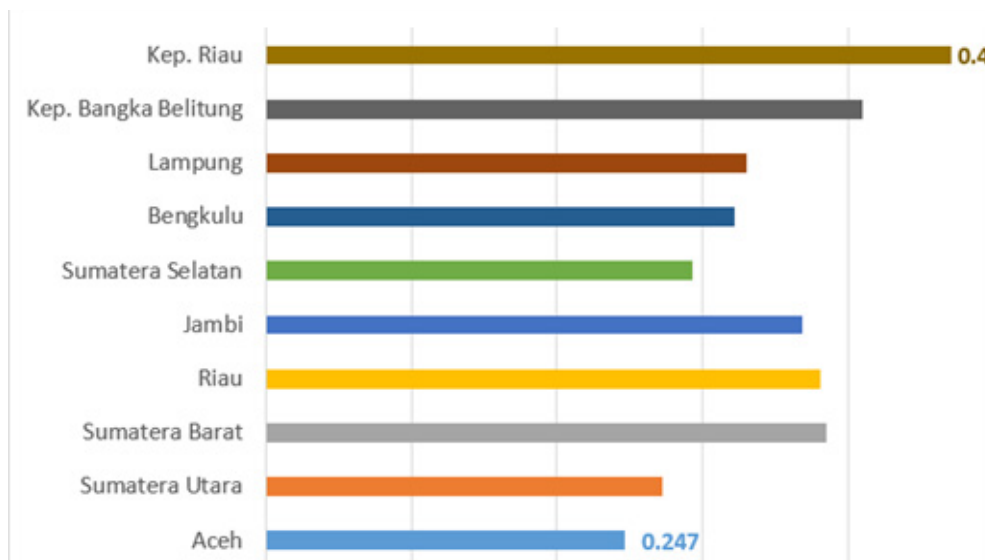| №	Province	Digital Literacy Index
1	Aceh	0.247
2	North Sumatra	0.272
3	West Sumatra	0.385
4	Riau	0.381
5	Jambi	0.368
6	South Sumatra	0.293
7	Bengkulu	0.322
8	Lampung	0.330
9	Kep. Bangka Belitung	0.410
10	Kep. Riau	0.472

Source: BPS, 2018 (Processed by Author)

Figure 2 illustrates that the largest digital literacy index is in Riau Islands Province, meaning the digital ability and proficiency of school-age children 12-18 years in the province is higher than other provinces on the island of Sumatra. In contrast, Aceh Province has the lowest digital literacy index of 0.247, meaning that school-age children there are less able or capable of using digital.

In this subsection, the research connects the inequality of educational opportunities and digital literacy of school-age children aged 12-18 years in Sumatra.

Figure 3 illustrates that in quadrant I, Riau Islands and Lampung provinces

Source: BPS, 2018 (Processed by Author)

Figure 2.
Index of Digital Literacy of School-Age Children by Province in Sumatra

have the most ideal conditions meaning that the province has low educational opportunities inequality and high digital literacy. Quadrant II, as many as 5 provinces have conditions where digital literacy is already high but the inequality of educational opportunities is still high. There needs to be a program from the local government to use digital progress in supporting education in the region so that the inequality of educational opportunities becomes ideal.

In quadrant III, Aceh Province has conditions where the inequality of educational opportunities is already low but digital literacy is still low. There needs to be socialization from local governments to raise awareness of digital literacy in school-age children. With digital literacy, children will use it to improve the quality of their education. In quadrant IV, the provinces of North Sumatra and South Sumatra have the least ideal conditions. This condition illustrates that there needs to be special attention for local governments due to the high inequality of educational opportunities and low

digital literacy in school-age children in this area. The implementation of digital-based programs on education and socialization of digital literacy is considered as a good socialization to return it to ideal conditions.

CONCLUSIONS

Inequality of educational opportunities for school-age children occurs in Sumatra Island. The length of schooling of children aged 12-18 years in Sumatra is influenced by per capita expenditure, gender and the highest education of household heads. PIP subsidies have no effective effect on the old schooner in Sumatra. Riau Islands province has the lowest educational opportunity inequality of 0.013 and Sumatra Province has the highest educational opportunity inequality compared to other provinces of 0.048

Digital literacy of school-age children in Sumatra shows that Riau Islands Province has the largest digital literacy index of 0.472. Riau Province has the small
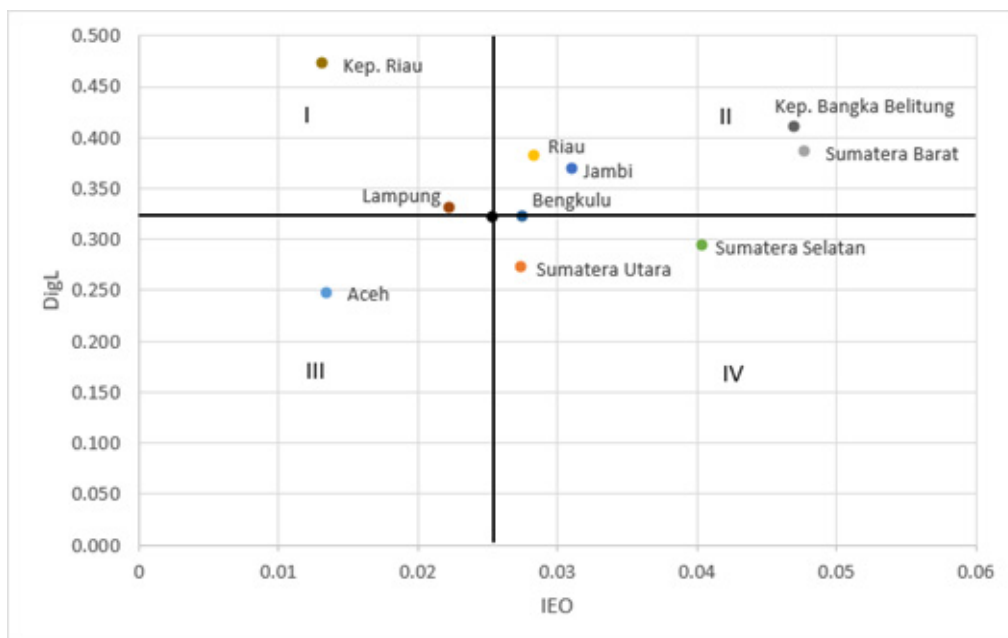
Source: BPS, 2018 (Processed by Author)
Figure 3.
Spreading Inequality of Educational Opportunities and Digital Literacy of School-Age Children in Sumatra

est digital literacy index of 0.247, meaning that in this province the ability and proficiency of school-age children to digital progress is lower than other provinces in Sumatra.

Digital literacy of school-age children supports reducing the inequality of children's educational opportunities. Riau islands and Lampung provinces have the most ideal conditions which have high digital literacy and low educational opportunity inequality. On the contrary, the provinces of North Sumatra and South Sumatra have the least ideal conditions where digital literacy is low and inequality of higher education opportunities.

There needs to be local government policy to solve this problem. Policies in the form of socialization in school-age children will be digital literacy and improvements in infrastructure supporting children's digital literacy capabilities are considered capable of improving digital literacy in areas that still have small digital literacy. Meanwhile, local government policies in the field of education in the form of digital learning programs are considered able to reduce the inequality of educational opportunities in areas that still have low educational opportunity inequality. The policy is very effective and efficient especially during the corona pandemic as it is today that prohibits face-to-face learning.

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