

Equality of Opportunity in Education and the Social School Model

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Abstract

Education forms micro-foundations for the solution of many problems in the world. In this sense, education as a tool for human capital accumulation and individual progress, schooling as a tool for education, and digitalization in the field of education as a facilitating factor are very important issues. However, according to the research conducted, schooling alone is not sufficient for economic development, and technology's efforts to transform education have brought some problems. In addition to these, education creates a financial burden for both household and government budgets. All these factors constitute an obstacle to equal opportunities in education. In order to solve these problems, our study adopts a supply and demand-oriented approach to the economy by examining the intersection of education, digitalization and the economy. It analyzes how education can be made more accessible by adapting it to digital development (supply), and also how policies that will increase students' access to these technologies (demand) are implemented. By revealing that the educational supply production mechanisms and physical and human-based educational inputs and the analyses based on these are sources of limitations and inequality in the classical face-to-face learning system; a new supply definition will be made that focuses on "information", and a new model that eliminates the heterogeneity between communication channels and inequality in access to information in the education process will be developed by taking advantage of the opportunities provided by digitalization. Our article offers theoretical and practical solutions within the framework of the new model brought by the Digital Primitive Economy Model (DPEM) and digitalization, by making the dissemination of information cheap, equal and accessible to everyone, to solve the problems arising from the adaptation of technology in education, to create an egalitarian structure in education and to minimize education costs.

Keywords

Equal Opportunity, Digital Learning, Education Economics, Social School

1. Introduction

Education is important both for reaching a better position and gaining better opportunities individually and for economic development. It is the person who builds up the world and disrupts its order. A person's thoughts and behaviors also change with education. In this sense, education provides micro-foundations for solving many of the problems that exist in the world. In addition, education not only ensures that individuals are in a better position socially and economically, but it is also the key to employment in professions that meet our basic needs.

Providing children with quality education that provides them with the tools to reach their full potential helps achieve sustainable development and break the cycle of poverty, as well as enabling upward socio-economic mobility (UNICEF DATA, 2023). Education is the key to well-being, liberating the mind, unlocking imagination and fundamental to self-esteem, and provides a wealth of opportunities to contribute to a progressive, healthy society. Learning benefits and should be accessible to all (The Global Goals, 2023). Education improves the livelihoods of those in informal jobs in agriculture and urban areas, and increases the likelihood that individuals will start a business and that their businesses will be profitable. Education helps people understand democracy and its foundations. It is vital in understanding the causes of climate change, preventing environmental pollution, and protecting human health, especially maternal and child health, and is an important element in efforts to prevent malnutrition and control the spread of disease (UNESCO, 2014). Education and training are important investments in human capital and can greatly increase personal income (Becker, 1994). A well-educated workforce is critical for nations competing in an increasingly global economy that rewards knowledge and skills (Brewer et al., 2010). Sustainable Development Goals Article 4.1 aims "by 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes". Education should be accessible to all, which is key to upward socioeconomic mobility and therefore freedom from poverty (UN, 2022).

While some of the developing technology has forced cognitive skills to evolve to adapt to it, others have caused machines to replace individual skills. The role of education is changing with technological advancement (Goldin, 1999). With the development of science and technology, industrial sectors have changed and this has increased the demand for qualified personnel such as competitive personnel and creative experts in these sectors. Therefore, it has become important to use and develop digitalized educational resources (such as computers, interactive whiteboards, tablets, and other equipment) in educational institutions that will provide these personnel with these skills (Davronovich & Mansurjonovich,

2023). Digitalization in education offers new opportunities. With the emergence of algorithms, AI, learning analytics and other smart education technologies, many new opportunities have emerged in the field of education (OECD, 2021). Effective performance assessment and homework control are among the benefits of using digital technologies in the field of education (Machekhina, 2017).

While digital transformation is dominating the entire world, the radical digital transformation attempt in the field of education has failed. Studies suggest that distance education has failed during the COVID-19 period, that the technology adapted to education has not delivered as expected, and therefore, face-to-face learning should be returned. In the digital transformation of education, a number of challenges have emerged due to various factors such as technology, socio-economic factors, human and pets' intrusions (distraction from humans and pets during the digital learning process), digital competence, assessment and supervision, heavy workload and compatibility (failure to implement online learning effectively and efficiently for some disciplines) (Adedoyin & Soykan, 2023). Using content analysis, 27 studies explored students' perspectives on distance learning during the COVID-19 pandemic, relying on surveys and questionnaires as data collection methods. The findings revealed that students appreciated the flexibility of distance education, as it enables learning anytime and anywhere. However, they also highlighted significant drawbacks, including physical and mental health issues such as stress, anxiety, fear, and attention difficulties. Additionally, the sudden shift to online learning exposed the lack of adequate infrastructure in many schools (Masalimova et al., 2022). According to the UNESCO Global Education Monitoring Report (2023a), many factors affect the spread of technology in education, from teacher willingness and equipment to the levels and income of countries and societies. Due to the short- and long-term costs of using digital technology, computers and devices are not used on a large scale outside the most developed countries. As a result, the report argues that although technology supports human connection, it should not replace the human, namely the teacher, and that technology should be complementary and supportive. Accordingly the inclusion of technology in education does not eliminate inequalities, but rather increases them. Only 60% of primary schools worldwide currently do not have internet access, and during the COVID-19 pandemic, one third of students have not been able to fully access remote education.

However, there are also problems with the face-to-face education model that they want to return to. What is important in individual earnings, income distribution and general economic growth is not schooling but the quality of education (Hanushek & Wößmann, 2007) and schools fail to provide the expected equality of opportunity in education (Pop, 2012; Francis & Weller, 2022). Throughout the history of education, educational inequalities have always existed. Children from wealthy families have achieved higher achievement scores and higher grades due to their ability to afford more costly education, and have had superior outcomes in terms of career and income after education. The basis of inequality in education

is inequality in access to school and education (Kafka, 2019). Without appropriate learning environments, quality education is not possible. However, school infrastructures vary across countries and regions, and one in four primary schools worldwide lacks basic infrastructure such as hand washing, sanitation, electricity and water (UN, 2023).

In addition, education costs are a burden on households and government budgets. The expenditure of countries worldwide on education amounted to 3.7% of their annual GDP in 2022 (World Bank, n.d.). Education has both explicit and hidden costs for households. The costs of education have explicit costs for households, such as tuition fees, textbooks and other materials, and also “hidden costs” such as uniforms. SDG 4 promises “to provide 12 years of free education”. However, if households bear the majority of the cost of education, the cost of education can prevent the poorest from going to school, which is a barrier to achieving global education goals. In many countries, household out-of-pocket spending is high even at primary level, while the increase is even greater at secondary level (UNESCO, 2017). Digitalization in education also comes at a cost, and except in the most developed countries, there is no large-scale use of computers and devices (UNESCO, 2023a). There is a financing gap of approximately \$100 billion per year for countries to achieve their education targets by 2030 (UNESCO, 2024a). Therefore, the level of development between countries is itself a source of inequality.

In summary, in this day where technology is used in every field, adapting technology to education and the widespread use of technology in education, especially in the field of distance education, cannot provide the desired efficiency and transformation, and this situation further increases the gap between students. In summary, although technology is used effectively in every field today, adapting technology to education and the widespread use of technology in education—especially in the field of distance education—cannot provide the desired efficiency and transformation, and this further increases the gap between students. In today’s world where technology is used intensively in every field, not using technology efficiently in education, or even using it in a way that disrupts equality of opportunity and increases the educational gap, indicates a major problem. On the other hand, schools and therefore schooling alone, which provide traditional education necessary for both individual socio-economic returns and economic development, are not sufficient for these purposes. In addition, the classical school system is far from providing equal opportunities. In addition to all this, with its current model, education has a cost to households and is a spending item in the government budget. Considering the alternative costs, despite all the investments made, equality of opportunity in education has not yet been achieved. The education costs required for human capital inputs cause a gap due to the differences between income groups within the country and between countries with development differences, and contribute to inequality of opportunity in education.

In order to use technology in a way that will close the development gap between students and make education accessible to everyone, reduce costs and provide

equal opportunities in education by getting rid of the side effects of technology in education, we ask the following research questions: “How can education be made compatible with today’s modern technology?”, “How can education costs be reduced?” and, in parallel, “How can equal opportunities in education be provided?”. In the continuation of our article, we will show the relationship between these three research questions within the framework of equal opportunities and that these three goals (adapting technology to education, reducing education costs and providing equal opportunities in education) will be solved together and in harmony. In this sense, our article will make a great contribution to the literature. The other contribution of this article is methodological. The Digital Primitive Economy Model (DPEM); approaches information from a different perspective, arguing that information is an asset that can be produced and consumed and that it has a supply and demand like other commodities, but information is different from other assets. Accordingly, information does not decrease as it is consumed, like other goods, and thanks to developing technology, increasing the supply of information and meeting its demand becomes easy and cost-effective (Babadağlı, 2024). Based on this, we will use the supply and demand approach in economics as a method to carry out our analysis, but we will do this by redefining supply in education in a way that has not been done before. In this sense, our article makes a unique contribution to the literature. In addition, the “Social School Model” put forward in DPEM will be examined to eliminate the disadvantages of distance education.

2. Literature Review

The term digital learning is quite broad. It is the use of educational applications of digital technologies outside of school for the purpose of improving student educational outcomes. The content of digital education covers “a wide range of digital tools and applications, including learning platforms, data and assessment systems, interactions, online courses, adaptive software, personal learning technologies, and student data management systems”. “The use of websites; Google Apps for Education; countless other software applications for math, reading, and other subjects; classroom management software and learning management systems; and computers, clickers, interactive whiteboards, and other technology products in physical classrooms” are among the digital education tools (Gemin et al., 2015). The benefits of using digital technologies in education include increasing the efficiency of the teacher’s teaching process and reducing paperwork, shortening the time spent on problem solving for students, increasing the quality of mastery of educational materials, providing effective performance evaluation and homework control. The latest digital technologies encourage group work, thus enabling exchange of views with classmates and the teacher. However, distance education, which is based on new digital technology opportunities, is a different topic in terms of the digitalization trend (Machekhina, 2017). With the advent of algorithms, AI, learning analytics and other intelligent educational technologies, many

new opportunities have emerged in the field of education. Thanks to artificial intelligence (AI) or machine learning, blockchain and robots used in educational systems, when students are working on mathematics on a computer, the computer can now examine how we are working and then make our learning experience much more detailed, adaptable and interactive. With the help of AI, sensors and learning management systems, it can adapt learning to different student needs and help students more about what they are learning, how they are learning, where they are learning and when they are learning (OECD, 2021).

Although technology has made life easier and increased efficiency in other areas of life, it has not been able to deliver as expected in the field of education, especially in distance education. The 2020 COVID-19 pandemic came mid-semester for most of the academy, including K-12 education, and a rapid transition from traditional face-to-face learning to remote learning was made, prioritizing safety to protect both students and educators from the contagious nature of the deadly virus. The rapid shift away from face-to-face contact and structures based on established learning formats such as physical building space, laboratory environments, seating arrangements, and student-faculty interactions did not allow time to properly design a virtual learning environment that lacked such close proximity between students and educators (Schultz & DeMers, 2020). The COVID-19 pandemic has made it possible to clearly see the impact of technology on distance education. Impact on Education In response to the coronavirus pandemic, school districts closed campuses in March 2020, and with little time to plan or train, they launched a massive experiment to educate more than 50 million students from kindergarten to 12th grade using technology. As the school year comes to an end, the ratings from teachers, students, administrators, and parents are that the outcome has been a failure (Hobbs & Hawkins, 2020). The COVID-19 pandemic has disrupted education systems globally, with the most vulnerable students being the most affected. Schools have been closed for more than a school year, and lack of connectivity and devices in distance learning has prevented a third of students from accessing remote education. This has widened inequalities and exacerbated existing education crises (UNESCO, 2023b). The OECD (2021) report attributes the success of technology to the fact that it is user-friendly and works in harmony with the teaching profession. According to the report, the technology is unlikely to work for learning unless teachers are part of the design of these tools. to cope with the COVID-19 pandemic in 2020, countries closed schools and transitioned to digital education. However, the disadvantages of distance education such as adaptation stress, screen fatigue and causing those who are unprepared and do not have adequate equipment to be left behind have been revealed. Distance education has continued the current educational practice rather than transforming education. Studies have shown that distance learning has not delivered what was expected, and that it has left schools and teachers in need (UNICEF, 2021). The emerging evidence on the effectiveness of distance learning during the pandemic is mixed at best. Learning outcomes have generally been worse with distance

learning compared to in-person learning before COVID-19 (Munoz-Najar et al., 2021). In the US, among the reasons related to student and parent demand for concerns about the continuation of various forms of online education implemented during the COVID-19 period, the social and emotional learning (SEL) needs of students, inequalities in learning opportunities and insufficient funds to meet staff were highlighted as three widely shared concerns (Schwartz et al., 2020). Durham University conducted studies on the impact of digital technologies on education. According to their experts, digital technologies should only complement traditional teaching methods, but not replace them, and should be used to their full potential by slower learners or students with special needs (Machekhina, 2017).

Digital technologies in distance education have had an increasing effect on inequality. In addition to the fact that children living in poverty, economic fragility, political instability, conflict or natural disaster are excluded from school, the digital divide also contributes to inequality. The fact that most school-age children around the world do not have internet access at home limits their opportunities to learn and develop skills (UNICEF, n.d.). The application of digital technologies varies according to the income of countries and the socio-economic status of societies, and the short- and long-term costs of using digital technology prevent those who are disadvantaged from using these technologies (UNESCO, 2023a). Research indicates that the move to remote education during the COVID-19 pandemic exacerbated existing inequalities in education. Students from lower-income families faced significant challenges due to limited access to technology, such as computers and reliable internet. These barriers led to reduced participation in online learning, making it harder for these students to stay engaged. Furthermore, economically disadvantaged students experienced delays in graduation and were more likely to take breaks from their studies, worsening the inequality gap in education (Messenger, 2021). In 2020, a series of 89 studies investigated the effects of the COVID-19 pandemic on education. The analysis revealed that the majority of these studies focused on teachers, were predominantly conducted in Asia and Europe, concentrated largely on high school settings, and primarily utilized online surveys as a research method. Key recommendations from the findings emphasized the importance of promoting equity, fostering collaborative activities, increasing funding for professional development and technological resources, and integrating both asynchronous and synchronous technologies in education (Bond, 2021). During the COVID-19 pandemic, most countries relied on digital distance education to maintain educational continuity. However, data from the UNESCO Institute for Statistics and the ITU revealed significant disparities: nearly half of the students participating in distance learning lacked access to a computer, and 43% did not have an internet connection at home. These inequalities were particularly stark in Sub-Saharan Africa, where 89% of households did not have a computer and 82% lacked internet access (UNESCO, 2020). Research shows that higher poverty levels are associated with lower broadband adoption rates, and

limited internet access contributes to poorer students falling behind academically (Fishbane & Tomer, 2020). According to the Facts & Figures 2021 report published by the International Telecommunication Union (ITU), affiliated with the United Nations, 2.9 billion people have still never used the Internet despite the increase in connectivity during the COVID-19 period. This rate corresponds to approximately 37 percent of the world's population, which shows us that the ability to connect to the Internet is unequal (United Nations, n.d.). In terms of the relationship between educational achievement and future income, inequalities in education that emerged during the pandemic period may lead to the continuation of the cycle of inequality in future nutrition, wealth, and intergenerational wealth (Francis & Weller, 2022).

Distance education has not delivered as expected and increased inequalities, revealing the urgent need for face-to-face learning. But is schooling enough to provide students with cognitive skills, and is the established school system successful? Contrary to popular belief, increasing schooling has not improved economic conditions and has not delivered as expected for development strategies. However, there is strong evidence that focusing on the quality of education rather than just school attainment and improving the cognitive skills of the population is strongly associated with income distribution and economic growth. Empirical results show the importance of both minimum and high-level skills, and the robustness of the relationship between skills and growth (Hanushek & Wößmann, 2007). Children who do not receive high-quality education face significant barriers to employment in the later periods. They also need to receive a good education in order to avoid suffering negative health consequences, increase their likelihood of participating in decisions that affect them, and contribute to the formation of a good future for their society (UNICEF, n.d.). The role of schooling and school quality in the economy has become quite confusing, in part because of attempts to defend different positions on education policy. Research shows that school quality has a strong impact on individual earnings, income distribution and overall economic growth (Hanushek, 2002). But aside from quality education, many children are deprived of access to school. The basic school infrastructure, which is non-domestic and varies according to regions, is essential for appropriate learning environments. However, one in four primary schools worldwide lacks basic infrastructure (such as sanitation, water, electricity, and hand washing facilities) (UN, 2023). The lack of attention to quality education and the failure to reach the marginalized have deepened the existing learning crisis. Worldwide, 250 million children lack basic literacy and numeracy skills, not to mention other skills needed to find good jobs and lead fulfilling lives (UNESCO, 2014). More than 600 million children worldwide, one-third of whom are out of school, are able to access education. Only one-third of children who have access to school achieve minimum proficiency levels in reading and mathematics. For out-of-school children, these basic skills are much more elusive. One of the main reasons why children are deprived of school is poverty (UNICEF, n.d.) High-poverty and high-minority schools have larger

classes, the least experienced teachers are concentrated in these schools, and less funding is allocated to these schools (Knight, 2019). When examining the empirical relationship between education inequality and income inequality, the results show that income inequality leads to education inequality and that education expansion is beneficial for reducing education inequality and income inequality (Yang et al., 2009). According to PISA 2022 Results, between 2018 and 2022, science performance remained largely unchanged across OECD countries, but the average performance in reading fell by 10 points and in mathematics by a record 15 points. In terms of basic mathematics competencies in OECD countries, socioeconomically disadvantaged students are seven times more likely to fail to acquire these skills than those with advantaged socioeconomic status (OECD, 2023). Wealth and education create a “cycle of intergenerational inequality”. Wealthier households offer the opportunity to get more education for their children and give their children the chance to create more wealth for themselves (Francis & Weller, 2022).

In addition to all this, it is predicted that some countries will not be able to meet their primary school teacher needs by 2030. Even greater difficulties are expected for other levels of education (UNESCO, 2014). At the beginning of the 2022/23 academic year, according to available data, 18 out of 21 countries were facing teacher shortages and countries had not been able to fill all the vacant teaching staff. Lack of teachers is a factor that can worsen inequalities (OECD, 2024). Empirical studies show that not only schooling but also the cognitive skills of the population are related to economic prosperity and growth. There are very large skill gaps between school enrollment and achievement in developing countries. Findings from international data suggest that there are often much larger skill gaps in developing countries than just school enrollment and achievement outcomes. Therefore, developing countries need to make major structural changes to close the economic gap with developed countries (Hanushek & Woessmann, 2008). From 2023 to 2030, the annual cost of transforming education in 48 developing economies is estimated to be about \$5.9 trillion, equivalent to 19% of the total GDP of these countries. The annual per capita cost reaches \$1300 to achieve goals such as ensuring universal access to early childhood care and education, advancing scientific research, and improving gender equality in learning (UNCTAD, n.d.). Households in developed countries spend less on their children’s education than those in developing countries (UNESCO, 2017). Indicators highlight that different demographic groups face inequalities in access to education, educational resources, proficiency, employment preferences and completion rates, and educational outcomes. These differences can be found between the socioeconomically disadvantaged and the advantaged, the least and the most able, men and women, and native and immigrant populations (OECD, 2024). The resources allocated to education and expenditure on education also vary depending on countries’ economic differences and education strategies, contributing to inequality in educational opportunities. Because the classical education model imposes considerable

costs on both individuals and governments. For this reason, differences in the development levels of countries cause differences in even the basic facilities offered in schools, which are a prerequisite for a quality education. As seen in **Figure 1**, approximately 40% of the schools in low income countries do not have access to electricity and almost half of them do not have handwashing facilities (UNESCO, n.d.).

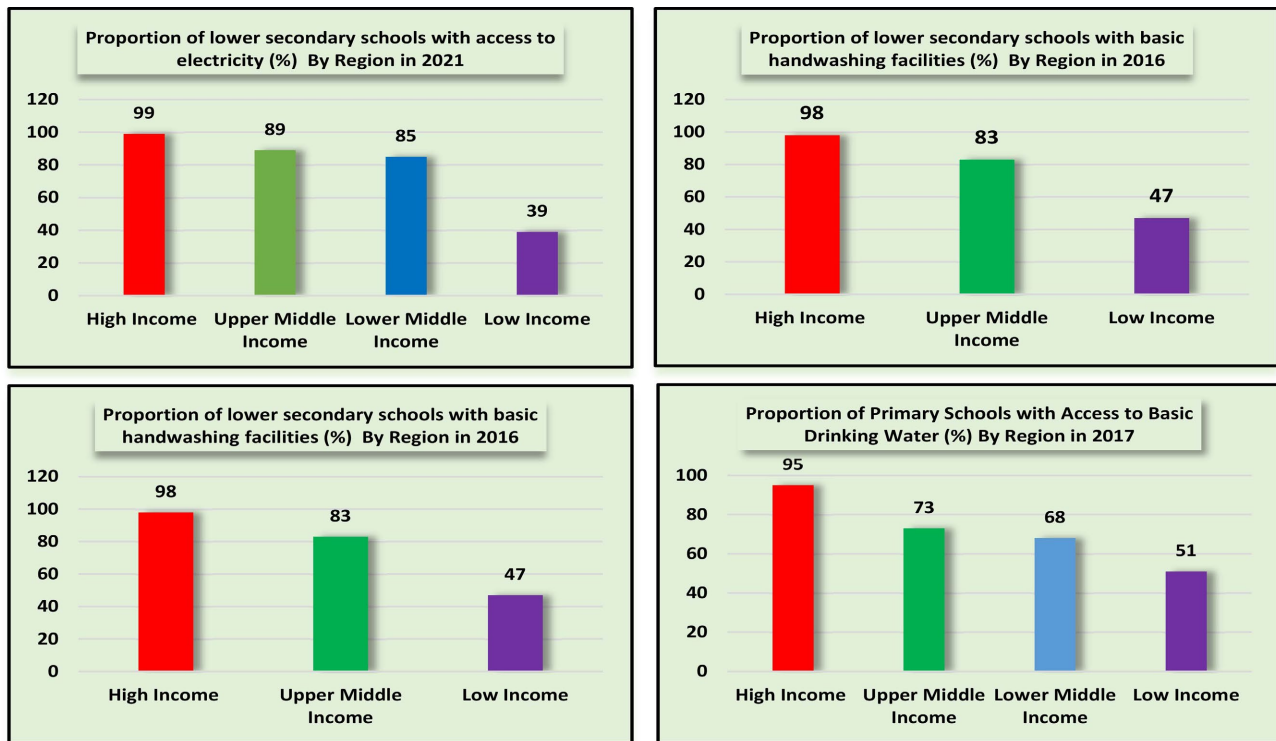


Figure 1. Basic school infrastructures by region. Source: UNESCO (n.d.).

In this new era, digitalization is fundamentally transforming our societies and economies in terms of development. Significant advances in digital technologies are leading to significant changes in every aspect of life (from how we communicate and access information to how we interact with our environment and how we do business), making our lives easier and more efficient. Embracing digitalization for a sustainable world is no longer a choice, but a necessity (World Bank, 2023). Artificial intelligence (AI), on the one hand, contributes to the improvement of people's lives and helps them make better decisions and predictions, on the other hand, increases productivity and efficiency, helps reduce costs and reshapes economies (OECD, 2019). While digitalization transforms the whole world and provides efficiency and convenience in every field, it is a big problem that digitalization in the field of education and distance education accordingly; lead to negative, at least questionable results and bring to the agenda the urgent need for schools. Other big problems are that schools implementing the established system are not sufficient on their own and that it is impossible to achieve quality and schooling in education at the same time with the existing resources. In order to

solve these existing problems, we approach education with the supply and demand approach in economics. However, unlike the literature, we bring a new perspective to the established supply and demand and do not use existing supply approaches and instead make a new supply definition. In this sense, our article makes a unique contribution to the literature.

3. Method

Since the 1990s, the economics of education has grown rapidly as a field. However, the pressure on school systems in developed countries to improve quality and scale has narrowed the gap between these two fields. Economics focused on firms, rational, selfish individuals who make decisions according to cost-benefit analysis, and therefore was considered superficial and devoid of social and moral values for an area such as children's education. On the other hand, economics was seen as a branch of science that studies private goods, while education was seen as a public good. However, with the pressure on school systems to improve quality and scale, the documentation that more educated employees have better cognitive skills, and the advantage of nations with more qualified individuals in a globalized world where competition is at the forefront, the evaluation of schools providing education in terms of the allocation of limited resources, and the centrality of choice and competition in economics, economists have begun to take more place in discussions on education reform (Brewer et al., 2010). The main research areas in the economics of education are human capital, economic efficiency (how the burden of education will be shared among different groups), the contribution of education to growth, the internal efficiency of education, the demand for educated manpower, education financing, and the effects of education on income distribution stand out (Woodhall, 1994).

Economists have also tried to understand how education is produced. Two approaches have been put forward for this purpose. The first approach is to consider education as a "production function". According to this approach, education is a production function in which schooling is a process in which inputs are produced and outputs are produced, and the processes take place within the black box of the school system. The second looks directly into "the black box". According to this approach, the organization is a network of interpersonal contracts in which individuals attempt to coordinate others in their work performance and are in turn coordinated by others (Brewer et al., 2010). In human capital theory, the basic idea underlying production function analysis is the "production possibility frontier", which is widely used in all undergraduate microeconomics textbooks. These studies, reviewed by Hanushek and Monk, are based on a very simple assumption: Education corresponds to a technology that must be defined and then used effectively. The definition requires an empirical analysis of the input/output cross-section. Correlation coefficients between all kinds of educational inputs, such as teacher salaries, class sizes, and capital expenditures, and outputs, such as standardized test scores, are calculated on a nationwide scale (Vandenbergh, 1999).

The production function, a tool that economists use to calculate resource allocation, describes the “maximum feasible output that can be obtained from a given set of inputs” and is based on the assumption that firms are “governed by certain technical relationships” and takes into account the choice of the amount of capital and labor to be used to produce a given output. Knowing the prices of each input makes it possible to find a simple solution for the “least cost” set of inputs, that is, the combination of inputs that will produce any given output at the minimum cost (Hanushek, 1987).

Production functions are often defined “the function as relating the amount of output produced per unit of time to the amount of resources utilized per unit of time in producing the output”. When machines in a factory sit idle, they produce nothing and provide no services per unit of time, while when they operate, they produce output. Similarly, workers who are idle do not produce anything. Workers may have different equipment, skills, and experience in using machines and materials effectively, and these differences may result in different products and outputs. Three concerns about resource use in production can be quite important: first, the time spent in the production process, second, the quality of resources used in the process, and finally, the interdependence of the effects of the quality of resources and the time spent on resources (Coates, 2003). The production function approach uses an “input-output framework” to make an analysis about the school. While managers, teachers, materials and facilities can be the main inputs in the production function, the main outputs are student achievement, that is, acquired knowledge and skills. Multiple regression techniques are usually used to estimate the relationship between educational inputs and outputs (Brewer et al., 2010). Educational production functions are also called input-output analysis or cost-quality and they examine the relationship between different inputs and outputs of the process in the educational process. It is quite common to use statistical techniques, especially regression analysis, to separate the effects of different inputs and estimate the magnitude or importance of any relationship (Hanushek, 1987). Behind most analyses in the economics of education lies a simple production model in which common inputs are things like school resources, teacher quality, and family characteristics, and outputs are student achievement (Hanushek, 2020). The educational production function and the educational supply are not the same thing. In a production function, there are inputs for educational production that can include spending per student, student/teacher ratio, and teacher education and experience levels, and the output measure is regressed according to a collection of inputs for production. The supply function, on the other hand, includes only input prices, the price of the product and variables (Brasington, 2003). It is also quite common to define the education supply in terms of “public expenditures for education”. According to Edding, public spending is probably the “most comprehensive and simplest measure of educational effort”, and his main contribution is to analyze the components of educational spending. It has been determined that the education expenditures made in the USA are due to the increase

in teachers' real salaries and price inflation. In this case, the number and type of teachers may be decisive in defining the educational supply (Panitchpakdi, 1977). Teachers are an input into education and are subject to the law of diminishing marginal productivity. Therefore, education exhibits diminishing marginal productivity in the production function. It is a fundamental feature of any competitive labor market that workers will be paid the value of their marginal product. Likewise, this means that teachers will be hired until their wages equal the value of the educational outputs they produce in school (Lovenheim & Turner, 2017).

In the literature, definitions such as current enrollment areas, public expenditures for education, and government support and financial support provided accordingly are seen to be made regarding the supply of education. In order to analyze higher education and create a supply and demand framework, supply and demand must first be defined. However, these definitions can be difficult to define and can be numerous. Previous studies have made some suggestions regarding the supply and demand of higher education. Rothschild and White defined the student supply of a university as "current enrollment areas" or "number of students to be accepted". The way to define the supply of higher education in a broad manner is to bring together the production levels at each university. Therefore, the total supply is measured by the total number of higher education institutions and the total enrollment at each of these institutions (Li, 2013). The section on the supply and demand of education related to schools is encountered in education books with the terms "demand for spaces" and "supply of seats" (Lovenheim & Turner, 2017). It is also quite common to define the supply of education in terms of public expenditures on education. According to Edding, public expenditure is probably the most comprehensive and simplest measure of educational effort and its main contribution is to analyze the components of educational expenditure. It has been determined that educational expenditure in the USA is due to the increase in real wages of teachers and price inflation. In this case, the number and type of teachers can be determinant in defining the educational supply (Panitchpakdi, 1977). The long-term supply curve of universities is not easy to analyze, because in the long term, they vary their production or supply by increasing the number of facilities, physical buildings, faculty members, classes and students served. There are various opinions that the long-term supply curve is tilted upwards, horizontal or vertical. If a university decides to increase production and, accordingly, increases the total student enrollment or the number of faculty members or facilities, and as a result, the cost per student increases, the long-term supply curve will be tilted upwards (Li, 2013).

The cornerstone of the literature of educational economics is the educational production function. Derived educational functions, whose numbers Decode hundreds, have improved economists' understanding of the relationship between educational inputs and outputs. The public supply also includes the price of schooling, so the difference between an educational production function and a supply

curve is very decisive. Due to the lack of an easily observable market that generates a market price for public schooling as a publicly provided good, the literature of educational economics has not estimated the supply of public education (Brasington, 2003). As a result, whether we consider the supply of education as public expenditures on education or teachers; as the number of students served in relation to faculty members, classrooms, and physical buildings; or as the number of available enrollments or students to be accepted, it ultimately involves cost and scarcity, and therefore, constraint. This makes education a limited good.

The fact that information does not decrease as it is consumed distinguishes it from other goods, and it is possible to reproduce it in today's technology without incurring additional cost (Babadagli, 2024). Therefore, the main purpose in education is to spread information, and with today's technology, it is possible to make the supply of information unlimited. In the supply of education, the fact that the asset to be supplied is not defined as information will turn physical structures such as schools, facilities, and teachers (and therefore the expenditures made on these elements) into factors affecting supply. In our article, we define supply in this way, unlike the previous literature. As far as we have examined the literature, there is no such approach in education economics.

The Changing Function of Education and the Supply of Knowledge

Since the beginning of the world, people, at least the vast majority of people, have not needed intensive education in the current sense. People were trying to maintain their own and their race's existence in the face of nature. Therefore, it was enough to know how to hunt, farm or raise animals to feed themselves; to know how to build houses for shelter; to know how to make yarn and knit for clothes. In these societies based on agriculture, this information, which was necessary to sustain business and was not very complex, was passed down from generation to generation. Therefore, there was no need for intensive education. Only a certain class received comprehensive education. Today, people need to receive education not only to earn higher wages and work in better positions; but also to meet their basic needs. If they want to eat, shelter and wear clothes, they have to have a profession, and the way to do this is through education, and this education is most commonly provided officially in schools, through teachers.

Schools are relatively new institutions in terms of human history. Evidence from anthropology shows that for hundreds of thousands of years before the advent of agriculture, people who lived as hunter-gatherers learned through their own play and exploration what their children needed to know to be effective adults. The hunter-gatherer lifestyle was knowledge and skill intensive, but not labor intensive. However, agriculture gradually changed this. Because with agriculture, people began to live in permanent dwellings where they cultivated their crops, and they cultivated, but these farming activities did not require much skill, but rather labor that required long hours of repetitive labor (Gray, 2008).

In the Middle Ages, students did not see university education as a situation where knowledge itself was the sole purpose of knowledge, as in primary education. A considerable majority of those who received university education considered the university as an institution that would benefit them for their practical interests. Therefore, a large portion of students turned to medicine and law, which taught them a profession and where they could find a job and earn a living, rather than theology (Cobban, 1971). In the Middle Ages, universities represented the culture of the 12th and 13th century European manuscripts, with their scarcity of books and distinct oral communication patterns. Although wax tablets were common during rapid composition and recording, the technique of teaching lessons by repeatedly reading from a book in the hands of teachers, in other words, word-of-mouth communication, also had an important place (Nyiri, 1997). The printing press and the increase in economic prosperity accelerated the spread of Renaissance culture after 1450. With the decrease in famine and plague and the establishment of peace, prosperity increased and as a result, colleges and schools were established where gentlemen and nobles' sons could receive education. The printing press was very important for the dissemination of information. With the printing press, there was a reduction in the cost of books and the cost of storing books in libraries. The demand for information increased and information became available to a large segment of the population. The "information revolution" brought about by the printing press is certainly on a par with today's Internet (Kreis, 2004).

As the Renaissance period began, the value of knowledge began to be understood, and theoretical subjects began to attract the attention of the middle class. However, despite this, knowledge was not disseminated to the base and was received through private teachers, thus creating a burden. It was observed that some middle-class families went into debt for educational expenses (Richardson, 1941). The most systematic structure that provided the official and institutional dissemination of knowledge was schools. Universities emerged in medieval Europe under the auspices of the papacy, and the institutionalization of mass schooling began with nation-building processes in the 18th century (Ramirez & Meyer, 1980). Ensuring that many children attended school regularly was a very difficult and controversial process. Especially parents who had not gone to school themselves often questioned whether school was necessary for their children. In the early nineteenth century, many children helped with work in the fields, outside, and housework, and in parallel, many primary schools charged tuition fees. Therefore, even parents who were willing to send their children to school might need the fees they paid for the school and the earnings they gave up. The agricultural lifestyle often kept students away from school and reduced the number of years they spent in school. At the same time, many European social, political, and religious elites considered mass literacy a potential threat (Rury & Tamura, 2019). Public schools had existed in the United States since the seventeenth century.

However, the idea of a state education system emerged with the first laws on

compulsory education for children. Public schools were the exception until the nineteenth century. Education was provided both in the family and in the church. In both Europe and the United States, schools were under the patronage of churches, and the basic manual was the Bible. Since there was no compulsory legislation, parents provided their children with an informal education at home, tailored to family needs. Therefore, children from poor families received an insecure education, while children from rich families mostly received their education in schools (Neamțu & Neamțu, 2023). In the nineteenth and twentieth centuries, public schools gradually evolved into the traditional schools we know today. For children, school began to replace factory and household work. The hours children were in school and the hours they spent doing homework outside of school were roughly the same as the hours adults spent at work. Just as adults were defined by their careers, children were defined by their grades (Gray, 2008).

Education can be defined as “the transmission of the values and accumulated knowledge of a society”. While primitive cultures do not need much education, as societies develop, the need for formal education, schools and teachers arises as the amount of information to be transferred to the next generation increases (Britannica, 2024). In ancient times, people did not need much information to survive and sustain life, and the information needed for these purposes was generally transmitted through the family. People who wanted to access information in different areas would gather around a philosopher or teacher. In ancient Greece, a philosopher and students following him were a good way to spread information and increase the supply of information at that time. However, due to the nature of this type of education, there was a very limited supply, that is, information was reproduced in a limited way. Not everyone had access to books and libraries. There was not such a great demand for information (need for information). With the invention of the printing press, the proliferation of books and written sources increased the demand for and supply of information. Later, establishing schools and making education compulsory also increased the total amount of information supplied to the highest level in history. Schools became so institutionalized that, over time, it was forgotten that the purpose was to spread information and that the asset to be supplied was information. In other words, the means of distribution of information supply have now replaced the supply itself. Supply factors have become inseparable from buildings, facilities and teachers, and education has been defined through official institutions, so all analyses are based on this foundation. As a result, teachers and schools, which were once necessary to spread knowledge, that is, to increase the supply of education, have become a factor that restricts supply (which can become unlimited with the development of technology today) and creates scarcity.

In fact, since the first human being, the asset that was offered was actually information itself. Various methods were developed to increase and spread it. The people who had access to information spread it to a group, then the invention of writing made it possible to convey information to others without being confined

to a limited time and space, the invention of the printing press and the increase in written sources, and finally schools became increasingly successful in spreading information, that is, in increasing the supply. However, the ability of today's technology to make the supply of information unlimited and accessible to everyone has now turned these old methods that increased information into factors that limited the supply of information. These institutions have become so entrenched that they have become the illusion that they are the supply itself, and in the literature we have examined, all educational inputs and all analyses related to supply are based on this foundation.

The way people live, communicate, interact and do business has undergone a profound and rapid change. This change is often called the "digital revolution". The digital revolution is defined as which is "the advancement of technology from analog, electronic and mechanical tools to the digital tools available" (Delgado et.al., 2015). "Digitalization of education is a powerful trend in terms of reformation and modernization of global education environment. Digitalization means transformation of all information types (texts, sounds, visuals, video and other data from various sources) into the digital language" (Machekhina, 2017).

Although schools and teachers emerged as the most advanced providers of information in a complex society, the digital revolution has changed this situation. The invention of writing can be considered the first, the printing press the second information revolution, and the emergence of the possibilities of storing, duplicating and traveling information to different times and places are milestones in the adventure of mankind. However, none of the studies and discoveries made regarding the duplication of information have been sufficient to make the supply of information unlimited. The digital revolution, which can be considered as the third information revolution in the dissemination of information and therefore in the development of civilization, has the capacity to offer technical opportunities that will eliminate the scarcity problem of information goods.

"Discipline that is concerned with methods of teaching and learning in schools or school-like environments as opposed to various nonformal and informal means of socialization (e.g., rural development projects and education through parent-child relationships)" (Britannica, 2024), defining education as formal education and basing the analyses on this basis leads to the problem of scarcity in terms of knowledge goods. Scarcity means that people's desires for goods, services and resources are greater than what is available. Resources (such as raw materials, land, tools, and labor) are in limited supply (Shapiro et al., 2024). The reason we care about resource allocation is that goods and services are limited. Therefore, scarcity limits the choices of consumers in an economy, makes goods more valuable, and can cause prices to increase (Investopedia, 2024). Therefore, scarcity arises from limited supply.

DPEM has presented a model similar to a perfectly competitive market, since information does not decrease with consumption like other goods, and therefore can be consumed unlimitedly, and since information has become a homogeneous

good by being made accessible to everyone thanks to digital technologies (Babadagli, 2024). “Economists use the term competitive market to describe a market in which there are so many buyers and so many sellers that each has a negligible impact on the market price. (...) To reach this highest form of competition, a market must have two characteristics: 1) The goods offered for sale are all exactly the same, and 2) the buyers and sellers are so numerous that no single buyer or seller has any influence over the market price” (Mankiw, 1998). An unlimited supply will meet the demand no matter how much it is. The homogeneity of the goods and the unlimited access of all those who demand information (having full information) to information will also create a market similar to a perfectly competitive market, and at the same time, thanks to technology, everyone will have access to all products in a digital environment, and consumers will have full information as in a perfectly competitive market. Based on this, our article redefines supply and treats it as “knowledge”, instead of supply definitions in education economics.

4. Equal Opportunities in Education and the Social School Model

4.1 Equal Opportunities in Education

Equity has been at the heart of policy for decades, particularly in education, and is one of the cornerstones of the Sustainable Development Goals. For an education system to be successful, it must provide the same opportunities for all students and be inclusive. This is a global initiative that advocates for quality education and equal opportunities for everyone, regardless of their background or circumstances. Equity in education includes structuring learning environments to counteract the impact of external inequalities, as well as creating conditions that contribute to equal economic and social outcomes after school (OECD, 2024). Equity is at the heart of the Sustainable Development Goals (SDGs), with Target 4.5 specifically aiming to “eliminate gender inequalities and ensure equal access to education and vocational training at all levels for the vulnerable, including people with disabilities, indigenous peoples and children in vulnerable situations” (UNESCO, 2019). Education can provide rich educational opportunities for individuals from low-wealth backgrounds, thus providing an opportunity to break some of the poverty chain. If wealth continues to be a prerequisite for the highest quality education, the education system may perpetuate intergenerational wealth inequality. In this case, wealthier households can provide better education for their children, thus giving them the chance to acquire more wealth (Francis & Weller, 2022). The most marginalized groups still do not have a presence at national and global levels in education. Many factors contribute to the perpetuation of inequality, such as motivation, political context and socioeconomic background, as well as differences among students in compulsory school systems. There is no public education system in the world that provides completely equal educational opportunities, however what is expected from public education systems is to promote inclusive education (Pop, 2012).

4.1.1. Teacher and School Differences and Equal Opportunities

Equity in education is one of the most fundamental targets of the Sustainable Development Goals (SDGs) outlined by UNESCO. This global initiative advocates “for the provision of quality education that ensures equal opportunities for everyone, regardless of their background or circumstances” (OECD, 2024). First, we will examine the “provision of quality education and equal opportunities” part, and then the “provision of quality education and equal opportunities for everyone, regardless of their background or circumstances” part. We will approach the first part in terms of digital technology, and the second part in terms of costs. Providing quality education and equal opportunities is possible with developing technology. With the replacement of the classical school system with distance education, the reduced burden on the government budget will be more than enough to provide free internet service and at least a tablet to disadvantaged groups. The decrease in education costs with distance education that includes everyone will provide everyone with an equal education opportunity “regardless of their background or circumstances”.

Education is defined as “the discipline concerned with the methods of teaching and learning in schools or school-like settings” (Britannica, 2024), and the quality of education depends on factors such as the school (including the school environment and surroundings) and the teacher. These factors—especially the teacher—are not inherently equal.

Studies have shown that differences in teacher quality are very important (Hanushek, 2020). The success of the education system depends on the quality of its teachers. Evidence shows that when teachers are supported, the quality of education improves, and when they are not supported, it deteriorates (UNESCO, 2014). More knowledgeable and experienced teachers provide better learning outcomes and provide higher quality education. Empirical studies show us that situational factors such as students’ ability levels, prior knowledge, motivation factors, curriculum goals, course objectives, and contextual factors are effective in making informed pedagogical decisions. In addition, teachers need to be able to analyze and evaluate specific learning episodes and combine all this information with their expert knowledge of the teaching-learning process. Therefore, making good pedagogical decisions depends on the quality of the pedagogical knowledge that the teacher has (Guerriero, 2017). Knowledgeable teachers are better at organizing students, keeping students focused, and managing the classroom. Knowledgeable teachers try out approaches and provide thought-provoking instruction to engage students in the task. They are considerate of students’ emotional needs and are sensitive to them, actively building warm relationships with them (Ulferts, 2019). (as seen in **Figure 2**) Trained teachers vary depending on the development level of the regions (World Bank, n.d.).

The way a teacher interacts with students is important for students’ learning (Brewer et al., 2010). To solve the learning crisis, it is necessary for all children to have teachers who are educated, motivated, enjoy teaching and able to identify

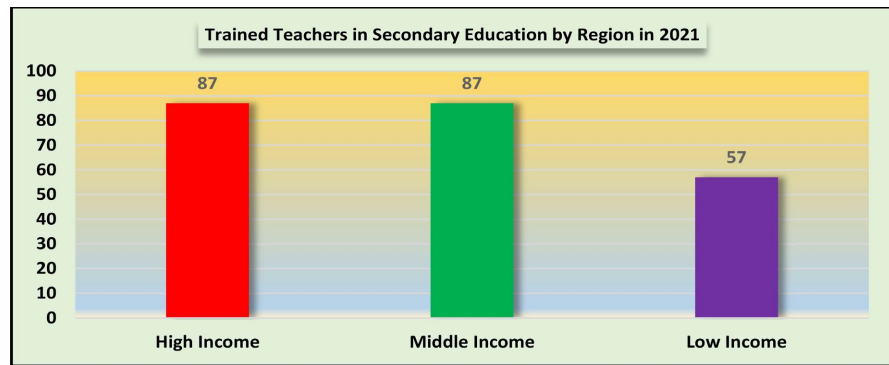


Figure 2. Trained teachers in secondary Education by Region in 2021. Source: World Bank (n.d.).

and support weaker students, supported by well-managed education systems. While salaries are only one of many factors that motivate teachers, they are important for attracting and retaining the best candidates. Low salaries can lead to low morale among teachers, who may decide to pursue a career elsewhere (UNESCO, 2014). However, the concepts of “good teachers”, “experienced teachers”, “knowledgeable teachers” examined in empirical studies remind us of the segment with which this situation is compared, namely “not good teachers”. In other words, the phenomenon of teachers who do not have sufficient knowledge, equipment and motivation to provide quality education in the absence of good teachers. And the limited number of “good teachers” leads us to the concepts of scarcity and inequality.

Teachers are the main input in the education production function (like administrators, materials, and facilities) (Brewer et al., 2010) and as an input, teachers are subject to the law of diminishing marginal productivity (Lovenheim & Turner, 2017). “Scarcity means that human wants for goods, services and resources exceed what is available. Resources, such as labor, tools, land, and raw materials are necessary to produce the goods and services we want but they exist in limited supply.” (Shapiro et al., 2024). This leads us to the concept of the “production possibility frontier” (Vandenbergh, 1999), which is the basic idea underlying the production function analysis in human capital theory. Because the resources spent on education are limited and have alternative costs; similarly, people’s talents are not the same and the number of talented people in a certain field is limited. There is no market mechanism that works well in the education economy. However, while limited require resource allocation and cost-benefit analysis, in the market mechanism scarcity requires a supply and demand mechanism.

“Diminishing Marginal Returns: Productivity of a given input declines as additional units of the input are added, holding all other inputs fixed. Adding additional units of an input, holding other inputs fixed, will eventually make each of those units less important for production.” Teacher salaries are determined by experience and education level. This means that teachers are often not paid their “marginal product of labor”. This can create a shortage of expert teachers, as

teachers' skills are valued by the labor market. Furthermore, the absence of compensating differences can create a shortage of expert teachers in more desirable schools (Lovenheim & Turner, 2017).

However, the scarcity problem cannot be solved by compensating differences because the aim is not to provide efficiency in production by paying marginal labor products, but ultimately to provide equality in education. In other words, in one sense, the aim is to provide access to good teachers (who are not homogeneous among themselves). As the recruitment of teachers continues, the quality of teachers hired and the law of diminishing marginal productivity will begin to decline. This creates quality differences in the knowledge goods provided through education and thus makes the knowledge goods non-homogeneous. In addition to all these, education, which is a public good, does not have a market price. However, the scarcity problem resulting from the limited supply of talented and experienced teachers leads us indirectly to the price mechanism and therefore to supply and demand analysis.

“When economists talk about supply, they mean the amount of some good or service a producer is willing to supply at each price. Price is what the producer receives for selling one unit of a good or service” (Shapiro et al., 2024). There is a clear difference between the concepts of “the education production function” and a “supply curve”. This is because supply includes the price of public schooling. As a publicly provided good, the education economics literature has not estimated the supply of public education because there is no easily observable market that produces a market price for public schooling (Brasington, 2003). However, this does not change the fact that there is a service in supply and that quality teachers are scarce. The high demand for quality teachers creates a competition problem.

“Often, the term teacher shortage is used to refer to an insufficient production of new teachers, given the size of student enrollments and teacher retirements.” According to this narrow definition, the teacher shortage is related to the production of teachers, which is also related to the demand. However, according to numerous studies, the production of new teachers is not the only factor in the teacher shortage. And factors such as “teacher turnover, changes in educational programs and pupil-teacher ratios, and the attractiveness of teaching generally and in specific locations” also have an impact on teacher staffing problems (Sutcher et al., 2019). Teachers are key to inclusive and equitable education, which is part of Sustainable Development Goal 4. According to new data collected for the Global Teacher Report, sub-Saharan Africa needs 15 million more teachers to sustain primary and secondary education, while there are 44 million more teachers worldwide. Not only is the teacher shortage endangering the future of education, high-income countries are struggling to retain existing teachers, with teachers leaving the profession in large numbers (UNESCO, 2024b). Unequal funding creates unequal distribution of experienced teachers across schools, as teachers are paid based on district-level salary schedules. The U.S. Department of Education has created new regulations requiring schools with high and low poverty rates to

allocate equal teacher salary funds to narrow the “teacher experience gap” to accommodate experienced teachers in poverty-stricken areas (Knight, 2019). In education, schools also have—like the teacher factor—various classifications and ratings. Teachers are naturally reluctant to work in deprived areas that lack basic amenities such as electricity, decent housing and healthcare. However, keeping the best teachers away from poor and dangerous rural areas because of this situation worsens the learning opportunities of already disadvantaged children due to larger classes, high teacher turnover rates and a shortage of trained teachers. Attracting and retaining the best teachers with the aim of ending the learning crisis requires ingenuity. There is a need to ensure equal access to well-trained teachers for all and to clearly address the needs of the disadvantaged and to provide adequate funding for these purposes. There are many factors that motivate teachers. Salaries are just one of them, but they are an important factor in retaining the best teachers and attracting the best candidates (UNESCO, 2014). There is a relationship between the size of school systems and their performance, with the strength and direction of the relationship varying depending on the socioeconomic status (SES) of the school system. Large systems have more resources than small systems, offering many opportunities for improvement in system performance. Large systems with greater resources can attract and retain expert staff by offering higher salaries, can more easily establish and expand expert support staff and research and development activities, can specialize their staff, and can increase the variety of services offered. They can also maintain and upgrade their facilities and equipment more regularly. However, larger school systems have the disadvantages of increased amounts of irrelevant communication, diverting much of the time and energy of their staff from core service activities not directly related to the delivery of services to students, and having a greater likelihood of seeing students with unusual problems. (Friedkin & Necochea, 1988) In addition to teacher differences, existing school differences can result in choice. Choosing where we live is a key element of school choice, and capitalizing school quality in housing prices effectively captures the valuation of differences in school quality (Lovenheim & Turner, 2017).

“What a buyer pays for a unit of the specific good or service is called price” (Shapiro et al., 2024) and competition eventually puts the price mechanism into effect, albeit indirectly. For example, better teachers want to work in more central schools and in better environments rather than in rural areas. With the introduction of private schools, conditions naturally create a situation in favor of those with effective demand, in favor of the new rich. Due to unequal opportunities in education, the fact that rich families offer better opportunities to their children is related to effective demand.

“Economists use the term demand to refer to the amount of some good or service consumers are willing and able to purchase at each price. Demand is fundamentally based on needs and wants—if you have no need or want for something, you won’t buy it. While a consumer may be able to differentiate between a need

and a want, but from an economist's perspective they are the same thing. Demand is also based on ability to pay. If you cannot pay for it, you have no effective demand. By this definition, a homeless person probably has no effective demand for shelter." (Shapiro et al., 2024). This creates a situation that is against equality due to the income differences of consumers.

How teachers are sorted across school districts can have profound effects on educational inequalities in schools, with teachers from wealthy districts paid more than those from poor districts. Thus, wealthy school districts gain a teacher selection advantage, while poor school districts may lose even existing, quality teachers as they transfer to schools in their wealthy districts (Lovenheim & Turner, 2017).

While on the one hand, the success of the education system depends on teachers and the qualifications and motivation of teachers are affected by many different variables; on the other hand, while digital technologies take the burden of people in all areas of life and education creates a significant cost both individually and publicly, many studies have revealed teacher-focused results (UNICEF, 2021; OECD, 2021; UNESCO, 2014). However, as seen in our study, teachers, who are at the center of today's classical education system, are the main source of inequality. Because not all students have the chance to reach "good teachers" at the same time. Moreover, good teachers are not homogeneous among themselves and of course, the qualities and talents of these good teachers are at different levels. Many factors such as teacher salaries, teacher skills and experience, motivation, ability to interact with students and knowledge of how to organize the classroom well affect teacher quality according to schools. Factors such as the curriculum and evaluation system, the school environment that attracts teachers and compensatory difference also affect the differences in teacher quality according to schools. Therefore, as we will discuss in detail following, the classical school system itself is a mechanism that produces inequality.

4.1.2. The Classical School System Leads to Inequality

The homogeneity of the source, message and channel is essential for the formation of equality of opportunity in education. Due to the classic school system's centralization of human education (teacher based), the messages from the source are differentiating, and therefore the classical school system leads to inequality of opportunity in education (Babadagli, 2024). Harold Lasswell is known for his "5W" communication model, this communication model focuses on "Who (tells) What (to whom) on Which Channel (with what Effect)" (Wenxiu, 2015) (see Figure 3). Lasswell's communication structure, consisting of five sections "Communicator, information, media, audience and influence", presents communication in its most basic (basic) form and is still used as a valid conceptual tool today (Sapienza et al., 2015).

Claude Shannon and Warren Weaver designed a model in 1949 in which the signal reaches its destination through a transmitter from the information source to the destination. In this model, information is affected by the noise generated by noise while traveling to the target (Khadija & Omar, 2023). Shannon and



Figure 3. Lasswell's construct as a graphic model of communication. Source: [Wenxiu \(2015\)](#).

Weaver communication system model is a “signal processing model” ([Flensburg, 2009](#), and this has led to the development of many other models ([Al-Fedaghi, 2020](#)) (see, [Figure 4](#)). The written, visual or verbal message selected from the information source is converted into a signal by the transmitter and sent to the receiver over a channel (such as a telephone wire). There is a coding by the transmitter (such as spaces, dashes and dots in a telegram). In verbal communication, the brain is the “source of information” and reaches the receiver via the air “channel” ([Shannon, 1948](#)).

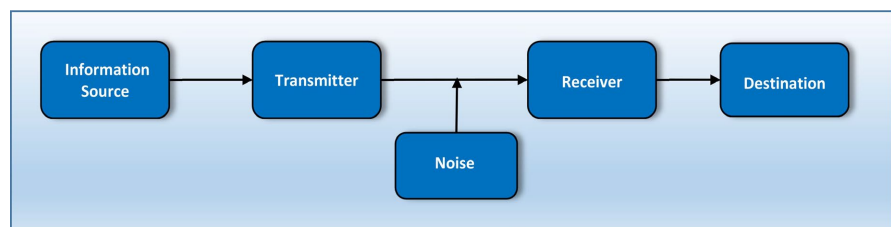


Figure 4. Shannon ve weaver communication model. Source: [Khadija & Omar \(2023\)](#).

When we examine the classical school system in the light of these communication systems, as we examined in Chapter 2, we see the difference in the source of communication. Not everyone has the same course materials and course resources. Even if we assume that they come from the same source, qualified teachers can enrich the course resource with their own knowledge and experience, or bad teachers can convey the information coming from the source in a limited way. For this reason, the teacher transfers the information he receives from different sources by differentiating it according to his own experiences and abilities. In this sense, while the messages given differ due to differences in information sources and teachers, other factors within the face-to-face education system also contribute to this difference. Differences in environments affect the communication quality of the message. The crowds of the classes, comfort, and teaching tools vary between countries and states, as well as between different neighborhoods in the same city.

Teachers are one of the most important drivers of student learning, and the data strongly support this claim ([Lovenheim & Turner, 2017](#)). The way a teacher interacts with students, and thus the teacher's experience and competence, as well as external inputs such as peer influence and family background, are influential in student learning. Furthermore, the outcomes themselves are joint products, meaning that students do not have experiences with just one teacher but carry over knowledge from other subjects ([Brewer et al., 2010](#)). Class size has been

found to have significant and substantial effects on test scores (Heinesen, 2010). Peer influence also has an impact on achievement (Sacerdote, 2011). Within-school comparisons of student test scores across different class sizes suggest that class size affects student achievement. Students in smaller classes achieve higher than those in larger classes. Students assigned to smaller classes in grades K-3 performed significantly better than their peers assigned to larger classes (Lovenheim & Turner, 2017). In addition, good teacher management is crucial to reducing learning disadvantage. It is the learning of poor children who suffer the most when teachers are absent or focus on private lessons outside of school. To prevent this, it is necessary to ensure that teachers arrive at school on time, fully comply with their assigned hours, and provide equal support to all. This can only be achieved with strong school leadership. In addition, support from teachers, school principals, unions, and community advocates are needed to prevent gender discrimination, prevent teacher abuse, and act against perpetrators (UNESCO, 2014). It has been found that “worse institutional facilities”, which are among the school-level school climate variables, have a negative impact on “student success” (Kwong & Davis, 2015). There is a relationship between the size of school systems and their performance, with the strength and direction of the relationship varying depending on “the socioeconomic status (SES) of school systems”. Large systems have more resources than small systems, providing many opportunities for improvement in system performance (Friedkin & Necochea, 1988). The OECD “Programme for International Student Assessment (PISA)” has shown that “attending school” can actually lead to very different levels of learning outcomes among countries (OECD, 2021).

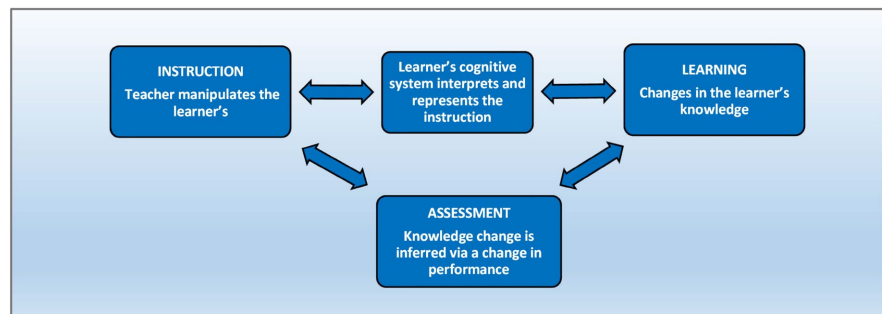


Figure 5. “Learning process” adapted from Mayer (2011), applying the Science of Learning. Source: Guerriero (2017).

“Under a cognitive view, instruction is defined as the manipulation of the learner’s environment to cause a change in the learner’s experience. A change in the learner’s experience is interpreted as new knowledge and is, thus, a learning process.” The learning process is shown in Figure 5 (Guerriero, 2017). The “manipulation” of learners’ cognitive systems by different teachers causes the change in student experiences and the new knowledge created to be different.

The receiver (learners) are also genetically different from each other. However,

there are factors that increase this difference. Nutrition is one of them. Nutrition, which affects the physical and mental development of the child both in the womb, during the development period and at school age, is related to income and culture. If we exclude preference and culture here, income inequalities and food access problems force people to have a necessary difference in terms of intelligence and physique. As a natural result of all these, the effect of information, that is, the message, differs. We will touch upon nutrition, one of the sources of all these differences, in the following sections and resolve it in connection with DPEM.

The current education process, which has differences at every stage of the communication process, is far from homogeneity and naturally contradicts the principle of equality. While trying to ensure equality of opportunity in education, emphasizing the human being, who is the source of inequality, and placing him at the center of teaching creates a paradox. People have different abilities. Therefore, teachers with different teaching abilities open the same code in different ways and deliver it to the recipient. Heterogeneity is not limited to this. At the same time, there are also different learning environments and different course resources. At the same time, there are many differences in learning environments. Noise can prevent the message from reaching the recipient correctly. While these inequalities continue, adapting technology to the current education system will further increase the gap between students. In fact, providing technological support in favor of more advantageous groups in accessing a good education will only increase this educational gap. For this reason, we call the effort to provide equal opportunities in education through people, who are the source of differences at the center, the “Equality of Opportunity Paradox” in our paper.

4.1.3. Cost Factor in Education

Government expenditure on education is 3.7% of annual GDP worldwide as of 2022 (World Bank, n.d.). Education expenditure includes expenditures both within the educational institution (for educational institutions such as schools and universities, and for ministries of education and education provision and support) and outside (for computers, books, and tutoring fees), as well as student living costs and student transportation costs not provided by educational institutions. Education core goods and services include all expenditures directly related to teaching and learning. These expenditures include all expenditures for the maintenance of school buildings, books, teaching materials, teachers, tuition fees outside the school, and the administration of schools (OECD, 2022). Textbooks, other materials and tuition fees are the explicit costs that households spend on education, in addition to hidden costs (e.g. uniforms). The explicit and hidden costs of education raise concerns about the poorest children and youth’s ability to achieve SDG 4’s promise of 12 years of free education (UNESCO, 2017).

The words “cost of education” are often considered to be the same as “education expenditure”. However, in order to conduct a “cost-benefit analysis of an investment”, it is necessary to define costs in terms of the total opportunity cost of a project (all actual resources consumed by the project). Every investment sacrifices

existing resources that could be used in another alternative investment. For example, building a school building may mean giving up a hospital building (Woodhall et al., 2004). In this respect, today's classical education, even if the human element is excluded, is not capable of offering equal opportunities due to the differences in economic development between countries, as it depends on the building, personnel and infrastructure. In many underdeveloped countries, school education is inadequate to provide the basic education needed to prepare children for the future. As Figure 6 shows, the proportion of students who achieve at least a minimum level of proficiency in reading at the end of primary school is 17% in low-income countries, but only 10% in mathematics (UNESCO, n.d.).

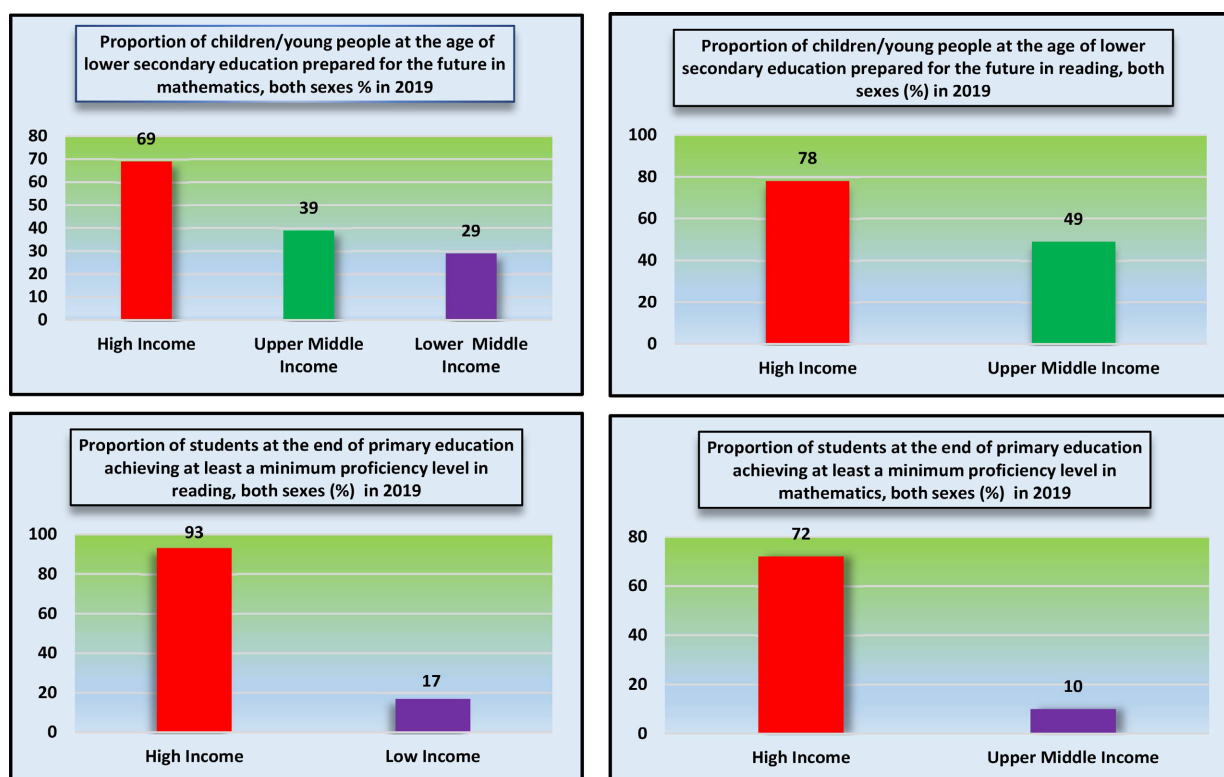


Figure 6. Differences in educational outcomes of students by region in 2019. Source: UNESCO (n.d.).

Education systems play an important role in providing individuals with the opportunities they need to live a good life, even if their socioeconomic status is poor. Dropouts and poor educational performance can be determined by factors such as poverty and place of residence. Therefore, to achieve equality in education, a government policy that is aligned with education policies that address this issue—including health, justice, welfare, urban policies, housing and social development—is also necessary (OECD, 2012). As a result, if we want to provide equal opportunities in education in the traditional school system, we must first equalize the level of development between countries, then ensure that all teachers have the same teaching ability, then provide access to the same source of information for everyone, and also equalize school and classroom environments and nutritional

conditions. It is not possible to achieve all of these, neither in theory nor in the real world. Therefore, while the classical school system, shaped by variables based on people and space, is the source of inequality, it is impossible to achieve equal opportunities.

4.2. Distance Education and Social School Model

DPEM argued that knowledge can be multiplied without incurring any additional costs by taking advantage of the feature of the knowledge asset that is presented, by taking advantage of today's technology, and proposed the distance education model for reducing costs and equal opportunities. Based on this, our article changed the definition of knowledge supply and placed knowledge at the center of supply. However, as we mentioned earlier in the section in our office, it turned out that distance education, especially implemented during the COVID-19 pandemic, was also unsuccessful in practice. This failure put teachers and schools back in the foreground and technology was only highlighted as an auxiliary element. In this way, the problems on the demand side of education caused by access to devices and connections, which cause difficulties in accessing education, are also resolved.

During the COVID-19 period, the most widely used methods for distance learning included synchronous e-learning and utilizing social media platforms (Mahasneh et al., 2021). Distance education, which was implemented during the Covid-19 pandemic, has failed because it was an attempt to adapt the traditional school system to the digital environment. Assigning a teacher to each virtual classroom for the purpose of adapting the traditional classroom system to the digital environment may fail even if everyone has internet access. Instead of adapting technology to the school system, the school system needs to be adapted to technology. Otherwise, the inequalities that exist in the current system will continue in the digital system (Babadagli, 2024). Adjusting the content of the educational curriculum to suit distance learning strategies provides cost savings and efficiency, but there is no guarantee that in-person learning and one-to-one implementation of the curriculum will work (Maria et al., 2020). The continuation of distance education activities during the COVID-19 pandemic by transferring the classroom environment to the digital environment has caused the physical classroom environment to be replaced by a digital classroom, and the real teacher to be replaced by a distant teacher. The virtual replacing the real, the distant replacing the nearby, did not solve the existing problems and added new ones. The differences in the technical skills and abilities of teachers and students in using technology have also increased the obstacles to equal opportunities. Similarly, students who lack access and experience due to the lack of technical facilities have also contributed to inequality. As we have shown in our study, the way to make the supply of information unlimited is to make it accessible to everyone by making use of digital technologies.

There is no way for everyone to have physical access to good teachers; however, there is a way for everyone (students and anyone interested in science) to have

access to good teachers in today's technology. The recordings of the lessons to be given by the most qualified teachers can be made available to everyone, both on official websites and on digital platforms, with free internet support. Thus, instead of a distance education model based on human teaching, a new distance education model can be created that provides the best service to everyone equally and unlimitedly.

Until this development process is completed, distance education can be carried out for certain disadvantaged regions without being connected to online and internet-based systems. This will make it possible to access the best teachers on a video-based basis. With the widespread use of the Internet, distance learning has changed and online learning has been used as a distance education tool in K-12, post-secondary, and professional development. However, in the era when the Internet was not available, printed materials, CD-ROMs, and video conferencing were used to facilitate education for these students (Gemin et al., 2015). Distance education is not a phenomenon unique to today. In the 19th century, it emerged with the development of postal services, and in the 20th century, distance education activities were carried out through television, radio, and other media. Distance education has also changed significantly with the developing technology (Phipps & Merisotis, 1999). Distance education covers a wide variety of situations, but in general it can be grouped into 2 categories. These are synchronous and asynchronous distance education. In the synchronous state, there is a real-time interaction between the teacher and the student (video teleconference, online chat, etc.). Asynchronous situations, on the other hand, do not provide facilities that allow "real-time" interaction between the student and the instructor. Dec. (e-mail, web/server based training, correspondence courses, etc.) (King et al., 2001). In some underdeveloped countries, access to the internet is expensive (UNICEF, 2021). In regions where access to the internet is limited, distance education activities can be carried out video-based (duplicating and distributing videos) as a temporary solution.

In addition, digital libraries were proposed in DPEM to remove obstacles to science and to provide free access to information for everyone. Equipped with books and materials whose authors' royalties are covered by international organizations, governments, foundations and volunteers, these libraries will make written and visual resources available to everyone free of charge, and with free internet access and other materials accessible on the internet, information will be made accessible to everyone (Babadagli, 2024).

4.2.1. Social School Model

During the distance learning process during the COVID-19 period, the majority of children (78%) stated that they missed their friends, and there is clear evidence of the effects of home learning and social isolation on children (Larsen et al., 2022). With the transition to online learning, students have experienced increased anxiety, stress, and difficulty concentrating. Therefore, social and emotional difficulties such as social distance and isolation, along with technological and

educational difficulties, have been factors that make online learning difficult (Lemay et al., 2021).

DPEM introduced the social school model as a new approach. The social school model is based on the principle of grouping schools according to their fields of activity and gathering them in certain centers in order to prevent problems that may arise with the transition of schools to distance education and to ensure monitoring and supervision in distance education. Another purpose is to allow students to socialize. Accordingly, education is divided into different branches and a separate central education service is provided for each branch. It is based on the principle that certain student groups receive education in these centers on certain days of the month and at certain hours according to education schedules in order to develop both applied courses and scientific development and weaknesses identified through feedback. In addition to courses, it aims to eliminate the disadvantages of isolation and inability to socialize through education centers to be established for each branch such as social activities, sports, arts and social sciences. However, this education does not include a program as intensive as classic face-to-face education. The social school model is a face-to-face education model limited to periods of 4 - 5 days per month (or hours suitable for this) in total (Babadagli, 2024).

Thanks to digital technologies such as AI or machine learning, robots, sensors used in education technology, learning can be adapted and personalized to the needs of different students. AI can also help inexperienced teachers read the classroom better and get up to speed. When the teacher is preparing the lesson plan for the next day, AI can tell who did well in the relevant assignment and who still needs to revise (OECD, 2021). The feedback provided by AI can help shape the face-to-face lesson program that students will receive in social schools, thus allowing their weaknesses to be supported (see Figure 7).

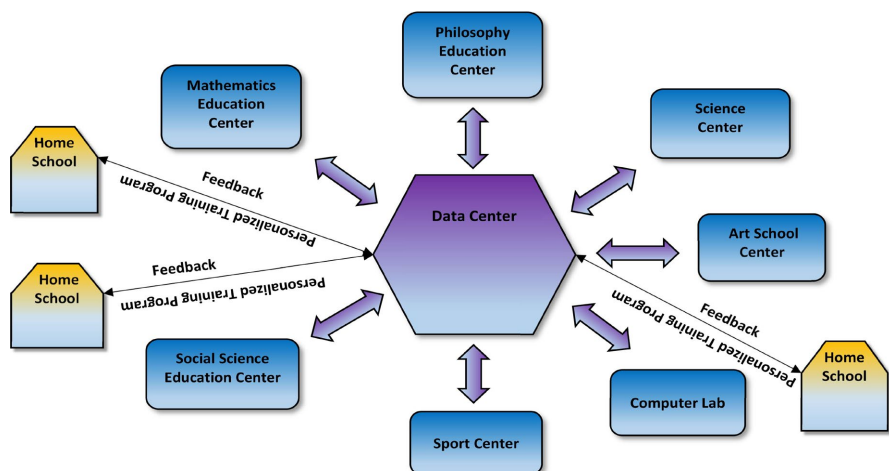


Figure 7. Social school model.

While on the one hand, it is revealed that human education leads to inequality of opportunity and that the model of reaching “good teachers” to everyone with

the distance education model that is not human-oriented is presented; on the other hand, the possibility that not everyone will reach good teachers in face-to-face education to be given in social schools seems like a contradiction. As we have stated in our article, the talented human resources employed in the field of education are limited due to the law of diminishing marginal productivity. Increasing the size of schools, class sizes and the number of personnel is one method for the supply of education to meet the demand. However, in our article, we argue that this is against the goal of quality and therefore equality due to the nature of the goods supplied. The other method is to shorten the service periods and make the scarce supply capable of meeting the current demand. With social schools, the number of face-to-face education hours and therefore the number of schools will decrease. The increase in the number of students receiving service thanks to the shortening of the periods in which a good teacher teaches—provided that the teachers who will teach in social schools are selected from among good teachers—will largely eliminate the problem of access to good teachers. Because in this model, students will receive face-to-face education from expert teachers in education centers on certain days and hours, and thus all students will have access to good teachers in face-to-face education. Moreover, in the DPEM model, this limited in-person learning is a supporting and auxiliary element of distance education.

DPEM advocates that the Primary School should remain outside of distance education and continue with face-to-face education for two reasons: one of these is the social development and basic educational needs of children, the other is the participation of women in business life and the effect of nurseries increasing the cost of living (Babadagli, 2024). In addition to this, children's ability to meet their needs on their own at home, especially in families with working parents, and security concerns can be added. For children receiving distance education at older ages, developing and affordable camera systems and home systems that can be monitored remotely with mobile phones will also help to eliminate security concerns.

A distance learning model that is not human-centered and is based on digitalization and accessible to everyone will eliminate problems originating from cultural, regional and socioeconomic differences. There may be differences in quality of education between regions in applied courses found only in social schools and in education received in art centers and sports centers. However, differences in quality between “good teachers” and differences originating from the fact that good teachers are not homogeneous within themselves are much more reasonable in terms of ensuring equality when compared to the lack of access to “good teachers” and applied science and art classes.

4.2.2. Distance Education, Costs and Resources

The transition of schools to distance education will reduce education costs in terms of human capital investment, and the increase in human capital will occur at low costs, closing the education gap between countries with different levels

of development and different demographic groups. It will reduce government expenditures based on reduced physical building investments and staff salaries, and thus students can be provided with devices such as a tablet and free internet support at very low costs compared to the expenditures made for the current established education system based on face-to-face education.

Another factor that leads to inequality of opportunity in learning is nutrition. Nutrition has strong effects on brain function. Iron, protein, iodine and breakfast consumption have an impact on a child's learning ability and behavior. Recent studies have determined that the roles of micronutrients such as vitamins, minerals and essential fatty acids are quite effective in preventing learning and behavioral disorders. Meeting nutritional requirements throughout childhood and an appropriate diet are essential for both intellectual and behavioral development of children, and conversely, inadequate nutrition of children negatively affects learning and behavior in many ways (Dani et al., 2005). Therefore, nutrition poses a disadvantage in child development and learning for families with limited access to these foods. This situation contributes to inequality of learning opportunities and leads to illness and educational losses. DPEM recommends planting fruit trees instead of landscape plants and trees planted in parks and roads and public areas, and that the products obtained from these trees be collected by public institutions such as municipalities, processed and packaged under appropriate conditions and distributed to the public (Babadağlı, 2024). This will help children in the womb to receive the necessary nutrients. In addition, these nutrients can be distributed to children in schools, thus closing nutritional gaps and thus providing more effective results on learning.

The traditional face-to-face school system is labor intensive, and governments are trying to reduce costs, including transferring some or all of the cost to the consumer. Reducing staff hours with "media intensive" distance learning methods is also a cost reduction method (Rumble, 2014). A study conducted in the second semester of the 2020/2021 academic year, aiming to explore the forms, benefits, and barriers of distance education during the COVID-19 pandemic, with a sample of 377 university students, revealed that the use of synchronous e-learning and social media channels was the most common distance learning method, and the benefits of distance education during the COVID-19 pandemic were reduced costs and the ability to review course materials. According to this study, the biggest challenges students faced were difficulties in following lectures, high internet costs, and connectivity issues (Mahasneh et al., 2021).

The Digital Primitive Economy Model (DPEM) aims to eliminate the "leaks" embedded in the cost of living by permanently meeting some basic needs, and thus reduce the lower limit of wage bargaining (other alternatives are also available in the model). DPEM, which reclassifies the basic needs that form the basis of living costs as "primary basic needs" and "secondary basic needs", aims to permanently reduce living costs by also taking advantage of the homogeneity of labor and electricity, and to eliminate the inefficiencies in the "wages share-aggregate

demand-driven business cycle” by ensuring that household investments allocated for housing investments become a source of funds for companies. In this sense, this model, which has theoretical and practical implications, can always be tested. Meeting “primary basic needs” free of charge depends on the support and planning of the government and local public institutions. Since communication and education are also included in the “primary basic needs” category in DPEM, projects that will make them free of charge in practice should be put forward as the ultimate goal with the coordination of the relevant institutions and the government.

5. Discussion

From a professional perspective, education represents the foundation of human resource development worldwide. Globally, society itself is constantly moving towards a knowledge-based economy, where education and performance are constantly evaluated according to performance indices and a comparison index between countries (Neamțu & Neamțu, 2023). However, the limits and efficiency of technology adopted in education are still controversial. According to some teachers, technology in schools today is seen as a tool that enables the personalization of the learning process and supports the development of university and career-ready skills in students. However, others see the use of technology in education as an addition to traditional teaching practices and a distraction for students at best. Parents and administrators also have similarly diverse opinions about technology in schools. Despite investments made to support the effective use of digital technologies in education, the value and impact of technology on student learning and teacher effectiveness are still controversial (Evans, 2019).

“If we teach today’s students as we taught yesterday’s, we rob them of tomorrow.” says John Dewey (UWC, n.d.). It is constantly complained that the classroom environment and learning style are the same as 100 years ago. However, a failure in a radical change experiment in the field of education leads us to immediately return to the old way or to continue the old system by allowing a little modification. Scientific and especially technological developments in the last century have transformed the whole world and have radically changed the methods of production, transportation, health and business in every field. This situation has caused a legitimate question about education, which mostly continues with similar methods.

The way people live, communicate, interact and do business has undergone a profound and rapid change. This change is often called the “digital revolution”. The digital revolution is defined as which is “the advancement of technology from analog, electronic and mechanical tools to the digital tools available” (Delgado et al., 2015). Although digitalization offers many opportunities in schools (Gemin et al., 2015; OECD, 2021; Machekhina, 2017), distance education, which was an opportunity and a great experiment for a radical digital transformation in education, has failed. Studies have revealed that distance education implemented during the

COVID-19 period has failed and increased inequality, and that teachers cannot be replaced and face-to-face education should be returned (Hobbs & Hawkins, 2020; UNICEF, 2021; OECD, 2021; Munoz-Najar et al., 2021).

Distance education, which was implemented during the COVID-19 pandemic, is an attempt to adapt the traditional school system to the digital environment, that is, to continue the old system. Creating digital classrooms instead of classrooms, putting distance between teachers who are nearby and students, assigning a teacher to each class as in the same school, and trying to synchronize teachers and students at the same time as in the same school may fail even if no one has access to the internet. Therefore, the reason why the distance education initiative failed during the COVID-19 pandemic was not only the lack of infrastructure. The real problem was trying to adopt new technologies to the old school system. However, what needs to be done is to adapt the school system to new technologies. The disadvantages and inequalities that exist in the school system will not disappear by trying to adapt the school system one-to-one (Babadağlı, 2024).

Although some approaches have presented more current or hybrid models of technology use in education, these understandings have not gone beyond slightly changing the old system, and the established system remains in place with all its elements. If the three complementary components—“teachers, students, and technology”—are well aligned, distance learning may have the potential to curb global educational inequality (Munoz-Najar et al., 2021). The UNESCO report (2023a) argues that although technology supports the human connection, it should not replace the human, namely the teacher; therefore, technology should be complementary and supportive. The World Bank (2021) report argued that the compatibility of the three complementary components, namely students, teachers and technology, has the potential to address the problem of learning inequality that has hindered global progress in learning poverty for too long.

So, does the classical education system enable us to obtain sufficient and satisfactory results? In order to ensure economic growth and improve income distribution, it is not enough to simply provide access to school. There is strong evidence that in order to achieve these goals, it is necessary to focus on the quality of education and to improve the cognitive skills of the population. Empirical results show the importance of both minimum and high-level skills and the robustness of the relationship between skills and growth (Hanushek & Wößmann, 2007). In face-to-face learning, good teachers are one of the most important factors for the quality of education. An education system is only as good as its teachers. Evidence shows that when teachers are supported, the quality of education improves, and when they are not, it deteriorates. Four strategies have been suggested to provide quality education for all children: selecting the right teachers to reflect the diversity of the children they teach, ensuring that teachers are trained to support the weakest students from the early grades, governments ensuring that teachers remain in the profession and providing the right mix of incentives so that all children can learn regardless of their circumstances, and finally allocating the best

teachers to the most difficult areas of a country to overcome inequalities (UNESCO, 2014). However, transferring a limited number of good teachers from one place to another does not eliminate the problem of scarcity. When good teachers are allocated to the most difficult areas of a country in order to overcome inequalities, students in more developed areas will be penalized with worse teachers.

In addition to being well-educated, teachers need to enjoy teaching, be motivated, be supported by well-managed education systems that can identify and support weak students in order to be more inclusive. Salaries are just one of many factors that motivate teachers. However, they are important “in attracting the best candidates and retaining the best teachers”. Low salaries can lead to low teacher morale. These policy changes come at a cost (UNESCO, 2014). If governments want to keep teachers in the profession, motivating factors such as salaries are included in the cost of education and therefore depend on the strength of the financial structure and the resources allocated for education. While education is already a burden on government budgets, steps to be taken to ensure the quality of education and equality of opportunity (for example, attracting a qualified workforce and ensuring that teachers are motivated or helping to provide equality of opportunity in education with compensatory differences, making reforms to improve the quality of education or making investments to enable the use of new technologies in education) will further increase the costs of education. Reforms and improvements in education are subject to budget constraints, and it is not possible to simultaneously ensure both enrollment and quality of education. Traditionally, educational goals have been determined by one of the following planning approaches: “manpower requirements, social cost-benefit, social demand and optimum resource allocation” (Panitchpakdi, 1977). Data show that there are wider skills gaps between developing and developed countries, beyond those stemming from enrollment and achievement. However, research has shown that simply allocating more resources to schools is often ineffective. The funds allocated will either have the ability to improve the quality of education or provide access to more schools. Focusing funds on a small group of schools to improve quality means less access (Hanushek, 2013).

The costs of education (individual education expenditures and government investment in education) require resources. First, resources are not unlimited. This leads to a “budget constraint” and a “production possibilities frontier”. In human capital theory, the basic idea underlying production function analysis is the “production possibility frontier” (Vandenbergh, 1999), which is widely used in all undergraduate microeconomics textbooks. Individual investments in education and government investment in education have alternative costs. Each investment sacrifices available resources that could be used in another alternative investment. For example, building a school building may mean giving up a hospital building (Woodhall et al., 2004). In cost-benefit analysis, direct expenditures and the gains foregone by trainees, students, and workers engaged in labor mobility constitute costs (Mincer, 1981). Second, individuals have different budgets and countries

have different levels of economic development. This leads to the concept of inequality, that is, inequality of opportunity in education. There is a relationship between the size and performance of school systems (Friedkin & Necochea, 1988). Families' education expenditures for their children are higher in developing countries than in developed countries (UNESCO, 2017). How teachers are sorted across school districts can have profound effects on educational inequalities in schools, as teachers in richer school districts are paid more than teachers in poorer districts. Thus, rich school districts gain a teacher selection advantage, while poor school districts may lose even existing quality teachers because they transfer to schools in richer districts (Lovenheim & Turner, 2017). Our study argues that people have talents, experiences, and personality differences, and that education being human-based is the source of inequalities. However, as can be seen, not only the human factor, but also all elements of the classical school system such as different schools, educational strategies and curricula, educational resources, school environment and peers lead to quality differences in education and contribute to inequality. In addition, with the DPEM model, as the share allocated to education from the government budget decreases with the elimination of schooling investments, the provision of internet connection and access to devices by the government will not create a burden on the budget, will create a situation in favor of disadvantaged groups and will contribute to equal opportunities.

The fact that information does not decrease as it is consumed distinguishes it from other goods. In today's technology, a single source can be copied billions of times, so it can be viewed and viewed on digital platforms without incurring any extra cost. (Babadağlı, 2024). Our article defines the asset to be supplied in the educational supply as information, and has revealed that the supply of information can be made unlimited thanks to the digital revolution. For this reason, it has associated classical supply factors such as physical structures such as schools, facilities, and teachers (and therefore the expenditures made on these elements) with limitations. Bringing the classroom environment of the classical school system together in a one-on-one virtual environment, implemented with the distance education model during the COVID-19 period, means limiting teachers to a group of students again, thus continuing the limitation of the supply of information. The solution to this problem is only possible by abandoning the human-centered approach in education, that is, by a distance education based on today's technological possibilities. The first benefit of distance education is that it brings education to everyone. The other benefit is to eliminate the scarcity problem in quality education. The only way for everyone to have access to the best teachers is to reproduce their lecture videos or images digitally and make them available to everyone. In this way, all students will have unlimited access to the same quality teachers and teaching materials. Providing information to everyone from the same source, through the same means, and eliminating differences in the learning environment will provide equal opportunities in education. In addition, distance education, where internet access and digital access tools are provided free of charge, will

eliminate educational investment costs and individual education costs.

However, distance education poses social and emotional challenges to students, such as isolation and social distancing (Lemay et al., 2021). In order to overcome these challenges, DPEM has developed the “Social School Model”, which operates as education centers grouped in certain branches, where face-to-face education will be provided in a classroom environment on certain limited days. The social school model is to prevent social isolation problems that will arise with distance education and to complete the deficiencies of students identified through feedback, and to receive face-to-face education with a certain group of peers in certain education centers, limited to certain days and hours of the month. However, this distance education does not cover primary education due to reasons such as day-care and caregiver expenses and the psychological development of children (Babadagli, 2024). This may include safety concerns, especially for young children of working parents.

Effective performance assessment and homework control are among the benefits of using digital technologies in education (Machekhina, 2017). AI, blockchain, and robots used in education systems can personalize education and provide insight into students’ weaknesses (OECD, 2021). With the personalization of education, AI can create personalized approaches for students, adapt the curriculum to the needs of the students, support the student in areas where they are lagging behind, and help create the course schedule that the student will take in Social Schools, i.e. provide feedback. In addition, with the DPEM model, as the share allocated to education from the government budget decreases with the elimination of schooling investments, the provision of internet connection and access to devices by the government will not create a burden on the budget, will create a situation in favor of disadvantaged groups and will contribute to equality of opportunity.

Distance learning faces difficulties such as inadequate technological infrastructure, financial and administrative difficulties (high costs required for the establishment and maintenance of distance education infrastructure), lack of devices, not every student having access to the same resources due to socioeconomic differences, lack of digital literacy, interaction and motivation problems, decrease in the quality of education due to ineffective implementation of practical courses (e.g. laboratory studies), decrease in reliability in measurement and evaluation processes, and emergence of problems originating from social isolation. Since the DPEM Social School Model is fundamentally based on distance education, it has to cope with these difficulties that distance education faces. As we stated in our paper, in order to solve the problems on the demand side of education, we recommend that the funds allocated from the government budget allocated for classical schools be transferred to create the necessary infrastructure and to solve cost and financing problems such as devices, connections and the inability of socio-economically disadvantaged groups to access devices. Again, in our paper, video-based distance education is presented as an alternative for the transition phase. Problems originating from social isolation in distance education and the decrease

in the quality of education due to deprivation in practical courses will be solved thanks to the practical education to be seen in face-to-face education and science centers in social schools. Again, in our paper, it is suggested that algorithms, AI and other smart education technologies personalize education and provide feedback to the social school data center. The fact that students can access the same resources is already the main subject of our article. It is thought that digital literacy and computer usage skills will emerge as a permanent method (just like reading and writing skills) and will become established, not due to a temporary situation caught unprepared. In terms of sustainability, the amount of e-waste that will emerge with the increase in distance education and digitalization can be compared to the decrease in transportation costs in in-person learning in terms of the environment, the amount of carbon emission due to the decrease in heating and electricity use of schools since there will be fewer schools in the social school model, and the decrease in the amount of e-waste that will occur due to the decrease in computers and devices used in schools. In addition to these, the unemployment problem that will arise due to the employment of fewer teachers is mentioned in the DPEM Model. Transforming existing schools into a central school that will provide education in a certain discipline requires time and resources. Existing schools may not be suitable for being central social schools. A transportation cost may arise for social school centers. These costs can be covered by governments or solved in the long term with DPEM's transportation model. DPEM envisages providing transportation on roads suitable for vehicles running on renewable energy and eliminating (or at least easing) transportation costs for households.

Since the human factor is the source of inequality, even if education is provided equally to everyone, some of the students who receive education will be more successful in achieving more successful results. Of course, providing equal opportunities in education to people, who are the source of inequality, will not make people who receive education equal in terms of success. However, the aim of equal opportunities is not to ensure that everyone reaches the same conditions at the end of the education and to equalize them in terms of success. It is to provide equal opportunities in order to understand the better ones more easily and to distinguish them more successfully. Much of the information learned in primary, secondary and high school is theoretical and far from being applicable in real life. One reason for this is to prepare students for a more advanced and complex education. However, perhaps the greatest purpose of exams and grades is to measure intelligence and work discipline and to continue on the path with the most successful students for vocational training. Therefore, the aim of providing equal opportunities is to prevent the better ones from falling behind due to worse conditions and becoming a source of waste of resources and inefficiency for the country and the world.

6. Conclusion

The aim of our article is to solve the problems related to the adaptation of

technology to education, and at the same time to provide equal opportunities in education and to reduce the costs of education—both in terms of individual and Government expenditure on education. Our article used the supply and demand method in economics as a method and made a new supply definition, different from the definitions in the education economics literature. Based on the concept of information supply, which is defined as a good that does not decrease as it is consumed in the DPEM model and can be easily and cost-freely reproduced thanks to the developing technology today and to meet the demand (Babadagli, 2024), we defined supply in education as information in our article and thus aimed to prevent supply constraints (i.e. scarcity problem) and inequality of opportunity in education.

Based on the effect of differences resulting from people not having equal talents, personalities, knowledge and experience on inequality of opportunity in education, we argue in our article that human-centered education, which restricts the supply of information, should be transformed. In addition, with distance education, there are also factors that create differences in education such as teachers, school environments, course resources, curriculum and educational strategies, peer influence, school and classroom management. In addition to these, the differences between the development levels of countries and the income levels in the society differentiate the educational opportunities and quality offered. For this reason, in our article, we define the aim of equality of opportunity in the field of education, first of all with the human-centered education approach and then with the other factors that create differences in the classical school system, as the “of equal of opportunity paradox”.

Again, in our article, we define the discovery of writing and the invention of the printing press as the first and second information revolutions, respectively. Thanks to these discoveries, great progress has been made in the increase of information supply. The classical school system has also made a great contribution to the increase of information supply. However, none of the discoveries made and the systems established have been able to make the information supply unlimited. Thanks to the “digital revolution”, which we define as the third information revolution, the information supply can be made unlimited without incurring any additional costs. The way to do this is to use digital technologies in the field of education, that is, through distance education. However, the distance education approach in the COVID-19 period is far from eliminating this supply constraint.

During the COVID-19 pandemic, the distance education initiative did not fail only due to lack of infrastructure. The main reason for the failure was trying to adapt new technologies to the old school system. However, what needs to be done is to adapt the school system to new technologies. Adapting the school system one-to-one to the digital environment does not eliminate the existing disruptions and inequalities in the school system (Babadagli, 2024).

Our article uses supply and demand in economics as a method. Today, the tools of quality education, “good teachers”, good school environment and good schools,

are limited in number and cannot be accessed by everyone. This situation leads to the problem of choice and competition. As we mentioned in our article, the preferences of good teachers are related to salaries, school size, good neighborhoods, housing and environment. Both these reasons and the existence of private schools indirectly activate a price mechanism and effective demand in education, which is generally a public good. In order to provide full equality of opportunity in the current education system, we need to ensure that everyone who receives education has the same income, the same opportunities (which is not our goal). In addition, from a macroeconomic perspective, another source of inequality is the resources allocated to education (if we keep the importance given to education and educational strategies that depend on resources constant) that change depending on the development of the countries (therefore, our model aims to eliminate costs). Even if we ignore these concepts that depend on income and budget, the human element in education will continue to produce inequality. Since the concept of a “good teacher” depends on the human element and teachers, who are an input to education, are subject to the law of diminishing marginal productivity, the problem of scarcity in good teachers (even if we assume that they are homogeneous among themselves) will never be solved.

In today’s school system, the human element comes into play due to the teacher who provides the transmission of information, and even if it comes from the same source, the information varies, and it is not possible for everyone to reach a qualified teacher and quality resources the same level. The classical school system inherently contains inequality. In order for equal opportunities to occur, “the source, message and channel” must be “homogeneous” (Babadağlı, 2024). In order for information to be homogeneous, the source of information must be the same. The way to achieve this is not a distance education based on today’s class system, but a distance education model where everyone can access the best teachers and course materials. With the elimination of schooling investments, the decrease in education costs (i.e. thanks to the resources to be transferred from the government budget), all students will be provided with connection and devices without production. The socialization and isolation problems that arise as a result of distance education have been solved with the Social School Model included in DPEM (which does not cover primary school due to reasons such as caregiver and nursery costs and child development and envisages a limited face-to-face learning).

If we go back to the definition of equality of opportunity, which is the fundamental basis of the Sustainable Development Goals (SDGs), it is defined as “quality education that ensures equal opportunities for everyone, regardless of their background or circumstances” (OECD, 2024). Our first goal is “everyone, regardless of their background or circumstances” and the current data show that the classical school system cannot provide education to everyone. Our second goal is “the provision of quality education and equal opportunities” and as we explained in our article, an education system that bases education on the human factor

(focused on human education) cannot achieve this. Our third goal is to eliminate the costs of education in connection with equal opportunities. While education already constitutes a cost, the disadvantaged groups brought about by competition for the good ones and the development differences between countries prevent “quality education from reaching everyone, regardless of their background and circumstances” and contribute to inequality of opportunity. The model we have built offers a solution to achieve these three goals.

7. Limitations and Future Directions

1) Our model is based on providing education to everyone from an equal source of information, by removing the human element from the focal point. However, in primary education and the social school model, the human element is reduced to a very small extent compared to the old system, but it still exists. Similarly, in the music, art and applied scientific education given in social schools, differences in human and educational materials may lead to some differences in the quality of education.

2) Social schools will be institutions that only provide education in certain fields (for example, history or biology) and students will receive face-to-face education with a certain group of students. The educational content and hours of education of these schools have not been detailed, and university education, which includes very different types of applications and specializations, has not been included in the model.

3) Since the education supply is largely produced by the public sector, the price mechanism does not come into play and the supply and demand analysis in the economy cannot be applied one-to-one as a method. The same applies to the perfectly competitive market. In fact, the perfect competition market is an ideal market type that is desired to be reached. Therefore, it is almost impossible to come across examples of such markets in real life. However, these tools used as an analysis method in the economy help us to build models that will ensure the efficient use of resources and their effectiveness. As mentioned in Chapter 2, education contains many concepts that can be associated with the economy.

4) In our model, education costs are theoretically eliminated. However, government education policies (even if face-to-face learning activities continue to be small) may create costs and cause conditions and opportunities to differ somewhat.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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