

United Nations Educational, Scientific and Cultural Organization (UNESCO)

Study Guide

Singularity Model of United Nations
SMUN 2030

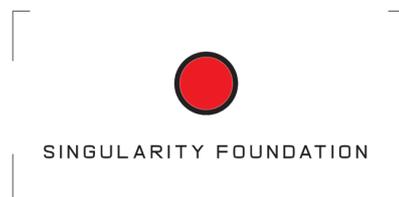


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1. Welcome Letter and Introduction of the Chairs

Distinguished Delegates,

Welcome to S'MUN2030 and welcome to the United Nations Educational, Scientific and Cultural Organization. Both the secretariat and all the chairs of the committees have worked unsparingly during the previous months to the conference in order to make your experience as fulfilling as it can possibly be. The topics proposed introduce challenging discussions about ideas which may not be under the general focus to this day, but whose outcomes will be important for the future of our generations. Henceforth, we want to encourage you all to prepare for the committee in which you will be participating, and to get to know the country which will be represented by you. The population and the institutions of these nations are in your hands, and we look forward to seeing you debate while carrying this great responsibility.

Introduction of the chairs

Chair Director:

Cheers delegates! Allow me to introduce myself, I am Martí and I will be enthusiastically chairing in this committee. I am a second-year student at Pompeu Fabra University where I am majoring in International Business Economics. My MUN experience began in 2018 while starting University when I joined the United Nations Students Association. With them I travelled to different countries like the UK or Italy participating in MUNs there and here in Barcelona. I have also participated actively in intern simulations within the association both as a delegate and as a chair. I will work to make your experience in this committee unforgettable, and to guide you towards finding solutions to this issue and acquiring a greater insight in the world of International Relations. Good luck and see you soon!

Chair Assistant:

Greetings delegates! My name is David and I am a Philosophy, Politics & Economics student from the Alliance 4 Universities (Pompeu Fabra University, Autonomous University of Madrid, Autonomous University of Barcelona and Carlos III University). I discovered my enthusiasm in International Relations while having an internship in the French Embassy in Madrid. Since then, I have always been interested about International Politics and MUNs have been a great door to experience one of my passions. Hope it is the same for you during this committee, in which all of you will have the opportunity to embrace your interests and have a fruitful debate. See you soon!

2. Introduction to the committee (UNESCO)

UNESCO is an agency created in 1946 by the United Nations with the objective of building peace through international collaboration in education, sciences, and culture. With this mandate, the organisation has put 193 countries together in order to launch projects promoting research, recognise different cultures, and spread knowledge around the world.

Some of the achievements that UNESCO has attained are preserving World Heritage sites, building youth network programmes or financing and promoting the creation, distribution and preservation of research and knowledge. UNESCO sponsors projects all over the world focusing mainly on helping developing countries at promoting literacy, spreading science advancements or training teachers amongst others. The institution also stands for freedom of press, cultural diversity and heritage, and has fought against discrimination and hatred.

Since 2015, UNESCO operates as well under the mandate of the 17 Sustainable Development Goals (SDG), and several actions of the institution have moved the international community closer to attain them. During our session, we will focus specifically on one of the goals which refers directly to the topic of our debate. This is the Sustainable Development Goal 4 (SDG4): “Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all”.

3. Introduction of the topic

In an interconnected world that moves at a fast pace, the evolution of humans is falling behind in terms of the needs that are required in a new environment. Under these circumstances, scientific research has been the responsible of providing answers and solutions to the problems that arose. Quite paradoxically in the past few years, some of these same researchers have been trying to create a development which doesn't directly solve one of our problems, but which instead becomes a developer of solutions in itself. This creation is named Artificial Intelligence, and in spite of not being vastly developed yet it has posed many questions on the impact that it will have in our lives and economies: How many jobs will this advancement make disappear? Is it safe to rely on a machine in order to solve our problems? To what extent should we give control to machines over aspects that affect directly our safety?

Henceforth, one of the main questions that has been raised and that summarizes all the previous ones is: How do we prepare the new generations for this process of

transformation? Up to this day, humanity has only found one efficient tool to give an answer to this question, which has been brought up in more than one occasion accompanying scientific revolutions. This solution is “Education”. With the mandate of finding an international and coordinated response, we are gathered in this committee where guidance for the future steps should be taken. As we previously mentioned, the focus of UNESCO includes a wide scope of objectives, and this specific session will lie upon the impact that AI in the SDG 4 and the process of development. Just like with every other advancement, UNESCO will play a role of seeking the spread of knowledge on the matter bearing in mind the opportunities that it grants and its threats.

4. Historical Background

Education

In order to understand the importance of our mission, we must first acknowledge the historical weight of the subject we have in hands.

Thousands of years ago, when humans still lived as hunter-gatherers, we lived free of all ties and exposed to all kinds of dangers. What differentiated the first species of humans from other animals and empowered them to live in bigger groups was language, which consecutively enabled the transmission of knowledge from generation to generation. These channels distributed the advancements in technology between different civilizations which as a consequence ended up converging in their ways of living. Under this context, the figure of the educator has been respected in all societies. Culture and alliterate individuals have been given special consideration in societies throughout the world. This credit also extends to civilizations, which are remembered today for their contributions to knowledge. It is the case of Greece, Rome, the Ottomans or the Egyptians who made crucial advancements for the development of the human species. The transmission was not always easy, which is why improvements in the channels of distribution such as the invention of writing (although different in each region), and the creation of manuscripts and books supposed great breakthroughs in societies. Thereupon, these were carefully preserved in libraries which, in cities like Alexandria or Constantinople, became historical monuments¹.

Nonetheless, the reality throughout the Ancient Civilizations and the Middle Ages was far from efficient: education and books were monopolized and managed by elite groups and religious institutions². It was not until the 15th century that the first educational systems and curricula were created, even if still not covering most of the population. Moreover, it was during the Industrial Revolution when efficient and widespread systems

¹ Optional reading: *8 Legendary Ancient Libraries*. The history channel Iberia (2018)

² It is also important to give credit to these institutions for the costly task of conservation and preservation of knowledge that they carried out throughout centuries.

were implemented and therefore literacy rates started to increase towards more acceptable values according to nowadays standards³.

Hence, although knowledge increased throughout history, its greatest growth was not seen until most people had access to it in the 20th century as it can be seen in Figure 1. With the Industrial Revolution as a main driving force of it, the transmission and creation of knowledge expanded exponentially thanks to a specific context and certain circumstances in which the role that institutions played was key.

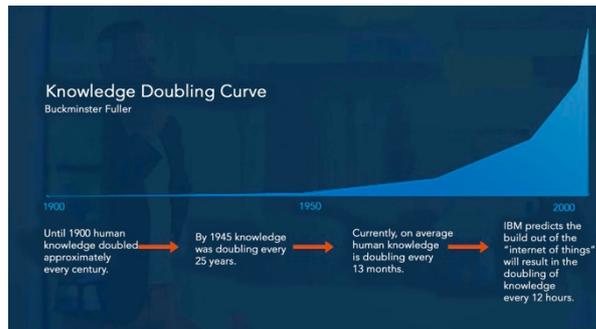


Figure 1: Knowledge doubling curve

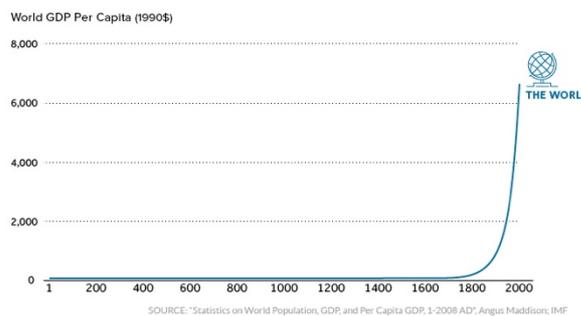


Figure 2: GDP per Capita in 1990 dollars: “Over 2,000 Years of Economic History in One Chart” (visualcapitalist.com)

These first education plans allowed to finally increase the literacy rate of many countries providing the capacity to all individuals of potentially becoming contributors or distributors of knowledge. This new context had a crucial impact on the economy of the most advanced countries, and in the world in general. We can also observe in Figure 2 how the knowledge curve previously mentioned is consistent with the growth of the total Gross Domestic Product (GDP) per capita of the world; the average income earned by someone in a specific country.

Nevertheless, this development process did not happen throughout the whole world at the same time. Due to different reasons such as but not limited to colonialism and

³ A Brief History of Education. Peter Gray (Ph.D.), Psychology Today (2008)

conflicts, some countries fell behind in this process and nowadays still haul many consequences.

Artificial Intelligence

Artificial Intelligence is a field of study and investigation that aims to develop systems or machines able to perform tasks for which a human mind would be needed⁴. Throughout history, philosophers have indagated on the different ways our brain works trying to define what intelligence or reason is. From Greek Plato in the ancient times, through René Descartes in the 16th-17th century, and up to the 20th century this was a field of study that fell under the competence of philosophers. These analyzed it very effectively and proposed theories which would become very useful in the future. It was not until 1956 that a research field would be born for the first time with the coining of the term “Artificial Intelligence” by John McCarthy in a conference in Dartmouth College, Hannover^{5 6}. From this moment on, advancements in the field were irregular depending on the waves of popularity and the funds for research available. Nevertheless, in the 2000s after overcoming the problem of enough computer power and the availability of data, the field started growing exponentially. This expanded its potential applications to the many aspects of our lives which we today observe, one of these being education.

5. Current Situation 2030

Like the name of the conference indicates, this summit is happening in 2030, so before going further into the topic, the specter of the current situation will be delimited.

In 2030, many of the SDGs have not been achieved yet, and several countries still struggle with poverty, instability, corruption and conflicts. Acknowledging that this will require an extra effort for the researching process of each country’s position, we will not dig deep into the specificities of each of their situations, but we will assume that in comparison with our world in 2020, the international state of affairs is as it currently is. The reason for this fact lies in one of the most important features of this new scenario: In the past decade (from 2020 to 2030), “Developed Countries” have offered a very low degree of both financial help and support to “Developing Countries”. This has caused a great consternation among the second who have found themselves stuck and unable to compete with the Western powers. The reason for this inactivity is the fact that during the twenties, developed countries have put a lot of focus on small conflicts between them such as trade wars (Brexit as an example), and immigration policies. In turn, these states have completely disregarded the pledges that the struggling economies were demanding.

⁴ Definition of “Artificial Intelligence”. Lexico Dictionary, powered by Oxford

⁵ *A Brief History on Artificial Intelligence*. Tanya Lewis for Live Science (2014)

⁶ Note: Despite the fact that the concept of machines making decisions as humans had already been referred and developed in other scientific and literary works (e.g. McCullouch and Pitts' 1943 “Turing-complete artificial neurons”), the workshop in Hannover has been widely accepted as the birth of the research field.

Features that will not be changed are the current inequality between and within nations causing different opportunities in education⁷, the lack of access to education of still millions of children in underdeveloped countries⁸, and the main fields of study included in education curricula. We will also take into account the fact that Artificial Intelligence has been slowly developing and has already been incorporated in some aspects of our lives, although it has not yet changed much our lifestyle. Notwithstanding, the labor market is increasingly demanding and valuing workers who possess a certain knowledge on the matter.

6. Artificial intelligence Diffusion and Development

Nowadays, in most countries there is some form of compulsory education established in the legislation. However, countries with less resources have not been capable of setting up efficient systems, and these have supposed that their labor force is less trained and professionalized, making it more difficult for them to adopt the newest technologies and to grow economically. In turn, the lack of stable growth and the low productivity make it hard for governments to collect taxes and finance good education systems.

This is a hard situation to manage for these countries, however it is of vital importance to find a way out. Richard Fisher, former President and CEO of the Federal Reserve Bank of Dallas, stated “A bad education system is the biggest threat to an economy and its surroundings in the long run”. It is for this reason that developing countries which are not able to stop this vicious circle sometimes through organizations like UNESCO or other NGOs, seek help from countries with more experience and a higher degree of stability. Furthermore, UNESCO has been focusing up to this day on creating tools, strategies and materials which can help states be more efficient by making their resources invested in education worth more. In addition, it has also been its task to keep all countries up to date on the changes that the new technologies bring to the educational curricula.

Like we saw in the past with other technological revolutions, their diffusion processes are not always even and sometimes can create disparities among countries. For example, in the case of the Internet the spread of the new technology was very different depending on each region. Many reports have been published studying the effects of the emergence of new technology and, resembling the trend in other historical moments, it has been proved that these changes tend to accentuate inequality between countries^{9,10}

⁷ *Education Index*. Human Development Reports, United Nations Development Programme (1980-2013)

⁸ *Right to education: Situation around the world*. Humanium (<https://www.humanium.org/en/right-to-education/>)

⁹ World Bank. 2016. *World Development Report 2016: Digital Dividends*.

¹⁰ The reason for this effect lies on the fact that some countries do not have resources to invest in adopting the new technologies, so the economic gap between the countries that adopt the technology and the ones that do not, grows larger. E.g. When Internet was invented, countries who could invest in computers and WIFI networks rapidly benefited from it, while other countries which were not able to do so fell behind.

- *Artificial Intelligence and diffusion of innovations*

According to Everet Rodgers' "Theory of Diffusion", every time a technological cluster/revolution appears, there are five types of countries: The innovators, the early adopters, the early majority, the late majority and the inadapted. The theory suggests that depending on the type that every country becomes, the possibilities of taking over a big piece of the market pie are different.

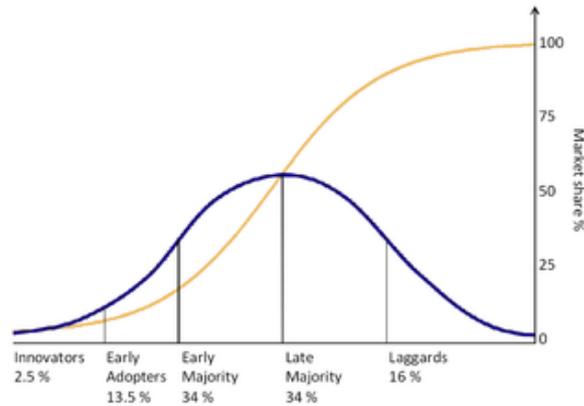


Figure 3: Process of diffusion and Market Share

In the graph of Figure 3 we can observe how according to this theory the first three groups of countries get the biggest part of the share of the market. Many experts on the field of AI still argue that due to the limited application of the technology on the market we still find ourselves in the first stages. Having all this information, this presents as a great opportunity for developing countries to invest on adopting these technologies in the curricula of the students in order to catch up with more developed countries. At the same time, these investments will have to be protected by avoiding that all the talent they create fleets away to western countries. In this sense the negotiation between states will be key in terms of finding a cooperation with the attractive countries who would have to give up an inflow of trained workers.

7. The implementation of Artificial Intelligence in Education Systems

Artificial Intelligence is a revolution that has been capable of transforming some aspects of the interactions of many people. These changes are seen on a daily basis in the personalization of the experiences (during searches or when selecting results) when navigating Internet or using Social Media. Besides, the scope of the use of Artificial Intelligence as a tool to enhance the quality of Education Systems is closer to being evident. The implementation of these systems into classrooms has created a debate on the advantages that they bring, versus the moral controversies that they suppose. It will be essential, first, to know the advancements that were made up to date, second, to

understand the functioning of these and its limitations, and third, the drawbacks and threats that come with them.

Opportunities

In the past few years, experts were able to prove that AI in education is more than science fiction matter. A study on the effectiveness of Duolingo¹¹ proved that by studying in the app for 34 hours, individuals could get the same results as if they had taken a University course throughout a year¹². Although the scope of application of the technology doesn't end here. Recently, companies like Squirrel AI, which apply innovative strategies of learning and provide complementary tools for students, have become increasingly popular in some countries like China¹³. At the same time, platforms for learning in the distance like ALEKS further provide resources at different levels of education (from Kindergarten to 12th grade, including university level) in the fields of mathematics, chemistry, introductory statistics, and business¹⁴. Furthermore, in Sweden, a company named "Lexplore" has developed a system that quickly scans for students at risk and detects dyslexia by tracking reader eye movements. In all the previous examples, students interact with adaptive interfaces that personalize learning experiences based on the student and her current level of learning.

More examples of AI applications in education which are worth taking into consideration are: iTalk2Learn, Thirdspace Learning, Thinkster Math and EdTech Foundry¹⁵.

Basis of new methodologies

As we have witnessed, the use of AI in classrooms brings many advantages that can suppose a breakthrough in the efficiency of previous models, but the understanding of these systems is essential to understand its limitations as well.

The role that Artificial Intelligence plays in these frameworks is very well described by the Knowledge Space Theory which comes from the approach of mathematical psychology on learning¹⁶. The theory intends to describe the knowledge that each individual possesses as a space where concepts learnt appear as dots which can be interconnected and related in the process of learning. In this sense, this helps computer programs of Artificial Intelligence to break down the knowledge acquisition process of a person as a process of integration of concepts which can be broken down to the simplest

¹¹ *What is Duolingo* – Duolingo Help Center (<https://support.duolingo.com/hc/en-us/articles/204829090-What-is-Duolingo->)

¹² *Duolingo Effectiveness Study*. Roumen Vesselinov, Queens College City University of New York (2012)

¹³ Our Story – Squirrel AI Learning

¹⁴ *What is ALEKS?* - https://www.aleks.com/about_aleks

¹⁵ *Top 5 Intelligence Tutors in education*. Richard D. Eddington, Big Data Made Simple

¹⁶ *Knowledge Space Theory*. Christina Stahl and Cord Hockemeyer (2019)

form. The role of Artificially Intelligent platforms is to guide the student throughout the whole learning process by making sure that he has assimilated all the concepts inside a subject and that he has understood the network of relations between them. Although the student might not be conscious of the whole process, the machine successfully detects the parts which the student may fail to understand immediately and puts a remedy to it faster as a human professor would do.

A final remark that becomes key when approaching the creation of tools for learning is the fact that Artificial Intelligence relies on the data sets that are introduced as a reference. This translates as follows: The efficiency of the systems depends directly on the size of the datasets in which all future responses are based. As an illustration, when AI seeks to recognize images of “Cats”, it is only able to do so when it is given a large number of pictures of different cats from which it is able to find patterns. However, if the patterns that it contains is not exactly replicated by the images that it tries to identify, it will get confused and perform poorly. For this reason, in this example if the amount of reference pictures of cats that it possesses is greater, it will be able to be more accurate in detecting Cats in the future¹⁷.

Drawbacks and threats

Personalization and creativity: As these supervised AI learning algorithms are based on historical data, they can only see the world as a repetition of the past. This has deep ethical implications. When, for example, students and their achievements are assessed using these systems, the assessment is based on the criteria that mirrors cultural past interpretations of success. From an ethical point of view on the role of education, children should be educated in order to develop the ability to think by themselves, and not only repeat the past. From this perspective, we must consider that AI is not able to develop essential competences like creativity and innovation.

Defenders of AI often argue that every day more complex systems are able to allow a high degree of personalization and diversity. Nevertheless, these competences consist of categorizing students into pre-defined classes, which again does not solve the root of the problem. For this reason, it is necessary to constantly evaluate the performance of these systems, a task that generally can only be carried out by a teacher or another educational expert that is not a machine or a program^{18 19}.

Ethical implications of usage of data from users: At present, the most important technical limitation of AI is the availability of data. This is why, many of the sources for the

¹⁷ *The Danger of AI is weirder than you may think*. Janelle Shane, TED2019

(https://www.ted.com/talks/janelle_shane_the_danger_of_ai_is_weirder_than_you_think?language=en)

¹⁸ Tuomi, I. *The Impact of Artificial Intelligence on Learning, Teaching, and Education. Policies for the future*, Eds. Cabrera, M., Vuorikari, R & Punie, Y., EUR 29442 EN, Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79-97257-7, doi:10.2760/12297, JRC113226. (**Executive summary**), (Link: <https://ec.europa.eu/jrc/en/publication/impact-artificial-intelligence-learning-teaching-and-education>)

¹⁹ *AI in Education: Where is It Now and What is the Future?*. Andrea Kulkarni, Lexalytics (2019)

improvement of the algorithms comes from data of the same users of the interfaces. In this sense countries must find a balance to regulate the usage that developers can make of the students' data without putting at stake their privacy.

Moreover, they will have to decide whether to allow in classrooms methodologies which may be more invasive as monitoring the facial expressions of students to enhance their personalized User Interfaces.

Lack of human contact: Finally, another limitation of AI is the limited scope of conversation that it can hold with another person. When studying the insights of business opportunities that AI presents, it is always considered that interactions with human beings always provide higher satisfaction among users. In the same way, permanent contact with robotized agents can lead students to phases of frustration which can be detrimental for their educational progress. It is for this reason that countries will have to evaluate the extent to which they ought to accept the robotization inside classrooms, and to redefine or restate the role of the professor.

8. Block Positions

Understanding that every nation in the world is different in many aspects shaped by their culture, values and institutions, in this committee every position and opinion will be accepted as long as it sticks to a realistic background. However, it will be useful to divide the expected positions on countries based on the similarities that may be within them. Furthermore, relying on the fact that we find ourselves in an increasingly globalized world where the path towards growth is quite clearly defined, it is not imprudent to presume that countries have several similarities among them and face similar problems. In this sense, we will classify countries depending on the problems that they have, making sense of a position that tries to resolve them in the best manner possible while preserving each state's sovereignty.

The two recurrent blocks which are proposed for this committee are: a block of countries in the process of development facing the group of countries which have already been able to develop.

Here below, the reasonable positions of the two blocks are defined:

Developing countries:

In this block, we find the countries which were not able to grow and develop in the past century, or that (for different reasons) at this point find themselves in a bad institutional or economic situation. The reasons behind their situation varies depending on the country, but in most cases are due to internal or external conflicts in the present or in the past. Also, it should be taken into account that many of these countries were former colonies and did not enjoy sovereignty to promote their development until they achieved independence from colonial countries.

In the committee the position of these countries can be defined with a clear tendency to be irritated with the inactivity of big powers in the past decade who have not done enough to ensure that the 17 Sustainable Development Goals are achieved. Following this line, they will demand a change in attitude, which should start in this committee's session. Their countries probably lack resources to make investments in AI, so they will probably need some aid. The main objective of these countries will be to not fall behind once again with this technological advancement, and to position themselves as competitive in the international specter.

On the other hand, there is the possibility that more advanced countries demand some actions in return for this, and their objective is that these demands do not undermine or affect negatively their populations and the power of their governments.

It will be key during the alliances to take into consideration the affinities that countries have between them, trying not to reach nonsensical agreements with nations which are absolute enemies.

At last, the objective of any resolution should be to materialize agreements between countries, and to elaborate the guidelines for a Plan of Action on how to transmit this technology widely.

Developed countries:

In this other block, we find quite a variate scope of nations. With different ideologies and cultures, this block is characterized by the fact that the countries that form it have already developed. Their Human Development Index²⁰ is high enough to consider that their inhabitants live fairly well, and their economies present a sufficient level of stability. Taking this into consideration we will see that here we find countries with more economic and institutional power than others in the same block. This may create conflicts that will have to be sorted out for the good of the international community. For sure we will find former Colonialist Countries in this block together with other powers which have been consolidated perhaps recently.

The reputation of this whole block is at stake in this committee after realizing that they have not achieved the SDGs, to which they compromised in 2015, and they will have the intention to at least make up a bit for what they have not been doing in the past. However, they will try to get some benefit out of it if possible, by asking in return from developing countries, which may or may not be related to AI development.

Since these countries will have already introduced some incentives to adopt AI and some startups will have started to emerge providing certain basic services like the ones mentioned in previous parts of the Study Guide.

Conclusion

²⁰ *Human Development Index* – UNDP Human Development Reports (<http://hdr.undp.org/en/content/human-development-index-hdi>)

Both positions have room for negotiation in order to make the most out of this summit. The key for a good performance and good deals in the committee will lie in the originality of the proposals of each delegation and its ability to convince others of accepting them. We encourage you to prepare and to be ready to bring forward your proposals and listen to the others'.

As a final remark, we want to remind you all that these proposals must be realistic and adequate to the committee, and always keeping diplomatic behavior and respect as the most important trait of each delegation.

Good luck Delegates!

9. Questions a Resolution must answer / Guiding Questions

- a. What compromise do countries take with respect to the Sustainable Development Goal 4 in order to achieve it? (both developed and developing)
- b. Under what grounds will states act towards ensuring that Artificial Intelligence is an innovation adopted by the whole world?
- c. What methodologies and strategies will be adopted in order to ensure a fast diffusion of this technology?
- d. What role will UNESCO play in the following years with regard to monitoring the compliance to the agreements?
- e. What is the position of the international community regarding the implementation of AI in schools?
- f. Under what grounds should it be implemented? How will the most innovative methodologies be adapted for developing countries?
- g. How will the field grant further research in the topic? (Origin of funds, who will provide the data for the new investigations)
- h. How will creativity be handled in classrooms which use AI as a tool?
- i. What will be the role of the educator or the teacher in the classrooms of the future?

10. Glossary of Key Words

Gross Domestic Product (GDP): It is the monetary value of all finished goods and services made within a country during a specific period. **GDP** provides an economic snapshot of a country, used to estimate the size of an economy and growth rate²¹.

GDP per Capita: GDP divided by the number of inhabitants of a country

(Economic) Growth: Increase of GDP of one year with respect to the level of the year before, usually expressed in percentage points.

Technological Advancement/Innovation: the generation of information or the discovery of knowledge that advances the understanding of technology, and which's appropriate use can have a positive impact on the Economy.

Technological Cluster: A coordinated advance in a specific field of study which becomes revolutionary for society and can be applied in other fields of study.

Hunter-Gatherers: members of a nomadic tribe, people who live chiefly by hunting and fishing, and harvesting wild food²².

Curriculum, curricula (plural): Set of subjects comprising a course of study in a school or college²³.

Literacy Rate: Number of people with the ability to read and write among a certain population.

Economic Instability: Periods of time in which the reliability of predictions over certain of economic factors is low. It is an important indicator of economic crisis²⁴.

Labor Market: Place where workers and employees interact with each other. In the labor market, employers compete to hire the best, and the workers compete for the best satisfying job²⁵.

Productivity: Effectiveness of productive effort, especially in industry, as measured in terms of the rate of output per unit of input²⁶.

²¹ *Gross Domestic Product – GDP*. Jim Chapelow, Investopedia (2019);

[<https://www.investopedia.com/terms/g/gdp.asp>]

²² Definition of “Hunter-Gatherer”. Lexico Dictionary, powered by Oxford

²³ Definition of “Curriculum”. Lexico Dictionary, powered by Oxford

²⁴ Further reading at: *Economic Instability*. Tejvan Pettinger, Economics Help (2017)

²⁵ *Definition of 'Labour Market'* – The Economic Times

²⁶ Definition of “Productivity”. Lexico Dictionary, powered by Oxford

11. Further Readings and UNESCO Past Resolutions

Useful Reports:

Francesc Pedró, Education Sector UNESCO: *Artificial Intelligence in Education: Challenges and Opportunities for Sustainable Development* (2019).

[<https://unesdoc.unesco.org/ark:/48223/pf0000366994>]

Tuomi, I. The Impact of Artificial Intelligence on Learning, Teaching, and Education. Policies for the future, Eds. Cabrera, M., Vuorikari, R & Punie, Y., EUR 29442 EN, Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79-97257-7, doi:10.2760/12297, JRC113226. [<https://ec.europa.eu/jrc/en/publication/impact-artificial-intelligence-learning-teaching-and-education>]

International Telecommunication Union. *United Nations Activities on Artificial Intelligence* (2019). [https://www.itu.int/dms_pub/itu-s/opb/gen/S-GEN-UNACT-2019-1-PDF-E.pdf]

U.S. Department of Education: Office of Planning, Evaluation, and Policy Development Policy and Program Studies Service. *Evaluation of Evidence-Based Practices in Online Learning* (2010) [<https://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf>]

Education Index. Human Development Reports, United Nations Development Programme (1980-2013). [<http://hdr.undp.org/en/content/education-index>]

Past UNESCO Resolutions:

BEIJING CONSENSUS on Artificial Intelligence and Education

QUINGDAO DECLARATION: Seize digital opportunities, lead education transformation

Interesting articles and informative videos:

Andrea Kulkarni, Lexalytics. *AI in Education: Where is It Now and What is the Future*(2019) [<https://www.lexalytics.com/lexablog/ai-in-education-present-future-ethics>]

Ron Schmelzer, Cognitive World. *Forbes: AI Applications In Education* (2019) [<https://www.forbes.com/sites/cognitiveworld/2019/07/12/ai-applications-in-education/#2ee3e73b62a3>]

Janelle Shane, TED2019. *The Danger of AI is weirder than you may think*. [https://www.ted.com/talks/janelle_shane_the_danger_of_ai_is_weirder_than_you_think?language=en]

[<https://singularityhub.com/2018/09/12/a-model-for-the-future-of-education-and-the-tech-shaping-it/>]

[<https://builtin.com/artificial-intelligence/ai-in-education>]

<https://www.visualcapitalist.com/2000-years-economic-history-one-chart/>