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Demographic and Intellectual Bonus: Science Development Innovation Using Current Modeling

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ABSTRACT

The demographic bonus is the window of opportunity enjoyed by a country as a result of the large proportion of the productive population. Currently, Indonesia is experiencing a demographic bonus, and this article aims to explain the demographic and intellectual bonus as an early development of the productive age, as well as its role in fostering innovation in science through contemporary modeling. Using a descriptive analysis approach, this research draws from relevant sources such as books, articles, and studies related to the topic. The findings suggest that the demographic bonus in the productive age can be beneficial if the education system produces graduates who are productive, forward-thinking, skilled, qualified, and capable of recognizing opportunities. Conversely, it could be detrimental if the quality of human resources is low-skilled and unable to capitalize on existing opportunities. The demographic bonus that occurred was also the window of opportunity with the dependency ratio reaching its lowest point of 44 of 100 which only happened once in the history of a population. Meanwhile in the field the development of science with contemporary modeling is the Science Technology Society . Science learning with the Science Technology Society approach means using technology as a link between science and society. That means that society must be more active and carry out scientific designs on all aspects of life including its application in the field of education.

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INTRODUCTION

Indonesia holds significant potential for resource development, particularly given the demographic bonus it is currently experiencing (Astuti et al., 2019) . This demographic bonus represents a favorable situation where a considerable proportion of the population falls within the productive age range of 15 to 64 years. It signifies a period of demographic transition marked by a decline in death rates followed by a decrease in birth rates, offering a window of opportunity for the country (Kemendikbud RI, 2045 Indonesia Golden Generation Roadmap (Kemendikbud RI, 2017; Noor , 2015) . Thus, the demographic bonus will be a big opportunity, if the population is large. productive age is balanced with the availability of job opportunities (Subandowo, 2017).

To increase the chances of success of the demographic bonus, the quality of human resources (HR) must also be improved properly because HR is the main foundation for the welfare of every country (Umar, 2017) . The quality of human resources can be described from three factors, namely income, health and education. These three factors are the constituent factors of Human Development Index (HDI). Therefore, HDI is an indicator that can illustrate quality of human resources. According to data from the UN, Indonesia is ranked 111th in the highest HDI among UN member countries with a figure of 0.707. This figure is included in the high human development category, which means that the quality of human resources in Indonesia is in the high category (O Duke & B Powles, 2008; Peterson et al., 2018).

As per Chapra (1999), achieving productivity and fostering economic growth is challenging without adequate education and good health. This implies that the quality of human resources, assessed through the HDI, has an impact on economic growth. Considering this, it becomes crucial to explore the opportunities and challenges posed by demographic bonuses to both human resource quality and the economy. This research was conducted with the aim of analyzing how big the potential demographic bonus is when viewed from current conditions and its impact on the quality of human resources and the economy through the development of science-based learning.

METHOD

Procedures

This paper aims to discuss demographic and intellectual bonuses: scientific development innovations with contemporary modeling. With the aim of seeing how demographic and intellectual bonuses as early development of productive age and demographic and intellectual bonuses as scientific development innovations with contemporary modeling. This study uses a library study method by collecting data from various library sources such as books and scientific articles that are relevant to the topic of discussion (Faisal, 1982; Sugiyono, 2019). The material object in this research is the development of science with a contemporary model, while the formal object is the demographic and intellectual bonys. Furthermore, in analyzing the data that has been obtained, the author uses descriptive analysis techniques which the author presents systematically and objectively.

FINDINGS AND DISCUSSION

Demographic and Intellectual Bonuses for the Early Development of Productive Age

Currently, until 2045, Indonesia is entering the demographic bonus era where the number of productive population (15-64 years) is 70.72% greater than the number of non-productive population (< 15 and > 64 years) of 29.28%. This means that 100 people of productive age will bear the burden of 41 non-productive people. This statement is proven through the results of a population census survey conducted by BPS (Central Statistics Agency) in 2020, as follows:

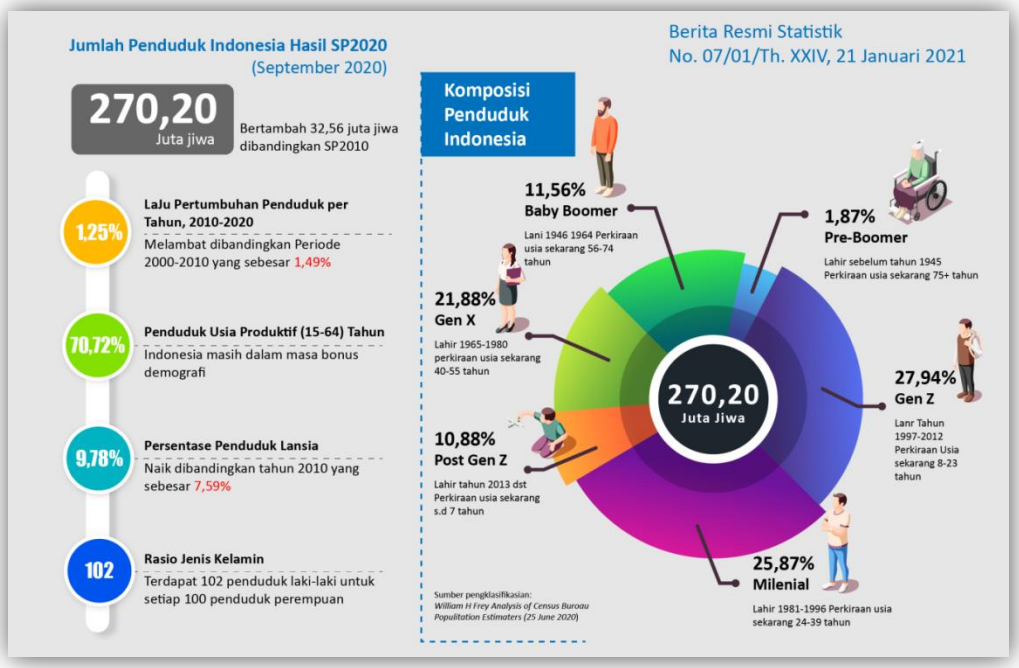

Figure 1. Composition of Indonesia's Population: Population Census 2020 (Latif, 2020)

The composition of Indonesia's population according to BPS is also in line with survey results according to SUPAS (Inter - Census Population Survey) showing that the majority of Indonesia's population is in the young age group. This is due to the still high birth rate or fertility in Indonesia. Although its distribution in Indonesia is not evenly distributed. Because most of Indonesia's population lives on the island of Java. This can be seen from the distribution in each province as follows :

1. Java Island, which has a geographical area of 7%, has 57% of the population
2. Sumatra Island, which has a geographical area of 25%, has 22% of the population
3. Kalimantan Island, which has a geographical area of 28%, has 6% of the population
4. The island of Sulawesi, which has a geographical area of 10%, has 7% of the population
5. Other islands (Bali, Nusa Tenggara, Maluku and Papua) which cover 30% of the area have 9% of the population (Falikhah, 2017).

The demographic bonus is like a double-edged sword, because it can be both a potential and a challenge. It becomes potential if it is able to take advantage of the opportunities and on the other hand it will become a boomerang, namely a burden if the government is not ready with the resources. human power. The demographic bonus that occurred was also *the window of*

opportunity with *the dependency ratio* reaching its lowest point of 44 per 100, which only happened once in the history of a population.

Figure 2. Pictures in Indonesian explaining about composition of Indonesia's Population: 2020 Population Census

Several experts believe that the demographic bonus has benefits, namely being able to increase gross domestic product (GDP), form a golden generation, and lighten the burden on people's lives. However, apart from the benefits obtained, the demographic bonus also comes with various challenges. This means, if we fail to manage the potential of the productive age population, it will give rise to several detrimental conditions. The following are a number of challenges that will be faced in the demographic bonus studied in this article along with their solutions (Latif, 2020).

The biggest challenge in achieving the demographic bonus is how to meet the need for superior and competitive quality human resources (HR). This is also a challenge in welcoming the second demographic bonus era as the number of elderly people increases (Setyowati et al., 2019) . Answering the first challenge requires investment from the world of education. When Indonesia is faced with a low workforce that has only graduated from junior high school (SMP) and is even lower, which is around 58.26% (75.37 million people), then this can have an impact on the productivity and competitiveness of the workforce. (Fathurrahman, 2002). To anticipate this, the key role of the world of education is needed to deal with the demographic bonus phenomenon (Munirudin, 2020).

The demographic bonus will be a blessing if the world of education is able to produce graduates who are productive, *forward looking* , skilled, qualified and able to read opportunities. On the other hand, it will be a disaster if the quality of human resources *is low skill* and unable to deal with existing opportunities (Rohana, 2023) . Quality graduates will be able to create their own jobs thereby contributing to helping reduce unemployment. In this case, universities need to prepare well the *outcome-based education* (OBE) curriculum that is currently being implemented - an education system that emphasizes what students can do well at the end of the learning experience. Why is that? Because the unemployment rate in this phenomenon will continue to increase because the number of productive ages is not proportional to the breadth of employment (Yumelking, 2023).

Indonesia must also be able to learn from countries that have succeeded in harvesting the demographic bonus and use it as a benchmark, as has been done by Thailand, Singapore and South Korea. These three countries have succeeded in investing in education to benefit from the demographic bonus (Subandowo, 2017).

Figure 3. Pictures in Indonesian explaining about composition of Indonesia's Population: 2020 Population Census (Latif, 2020)

South Korea, which is known as the "Ginseng Country", has succeeded in changing management in the economic field and using an intellectual capital strategy by sending as many of its young generation as possible to study abroad which will later become the main driving force of the economic pulse. Proof of this is South Korea's success with its demographic bonus in being able to increase the country's growth from 7.3% to 13.2%. Thailand and Singapore also do not want to be outdone, they prepare their intellectuals through high-quality education and provide scholarships abroad. After graduating, intellectuals were given the opportunity to move the economy. The demographic bonus can increase Thailand's growth from 6.6% to 15.5%, while Singapore's from 8.2% to 13.6% (ILP, 2022).

The second challenge is the need to prepare productive elderly people. Realizing this golden opportunity requires human capital deepening, that is, all human resources and efforts are devoted to improving the quality of human capital, one of which is in terms of education for the elderly because they still have the right to receive education as long as they are willing and able to learn. In principle, learning is carried out throughout life (*life long learning*). (ILP, 2022) . An elderly person's level of intelligence will remain honed if the brain is trained and used to think. Why choose the elderly?

There are several reasons, namely (1) so as not to miss information about the latest technology and information; (2) to be aware of the latest socio-cultural changes; (3) preparing to enter a new job; (4) make retirement a meaningful and interesting period; (5) developing skills so

that they can live independently; and (6) pursuing past goals that have not been achieved. The educational path taken by the elderly can be done through formal/non-formal education. However, application of education is not the same as other age groups. In educational activities, they are no longer the object of socialization, but rather lead to the strengthening of identity. The characteristics of different learning recipients also need to be taken into account so that we must be able to develop learning methods, teaching and learning activities, and even their learning media (ILP, 2022).

One of the programs that has been carried out by East Stroudsburgs University " *lifelong learning opportunities in Monroe County* " for the elderly is a course program such as art, health, sports and writing which is carried out classically in class/virtual/distance online. They have access to various campus facilities. Apart from communicating with the community, they can interact with the younger generation on campus. If young people can be active, productive and healthy, even the elderly can go through life long learning in improving education (Sticht, 2002) . Government support is also needed in this case. It is also hoped that the Indonesian government can design a program to prepare the elderly as done by Japan through the *Silver Human Resource Center* (SHRC) - a program that supports the elderly to remain productive and helps them find part-time work flexibly (ILP, 2022).

Indonesia must be optimistic about achieving progress when it turns 100 in 2045. The younger generation as intellectuals and productive seniors can be used as potential and assets to achieve success in facing the demographic bonus. Without good preparation, the negative impact of the demographic bonus could occur. Based on BPS data, the open unemployment rate in Indonesia in 2019 decreased by 0.06 percent compared to 2018, namely from 5.34 percent to only 5.28 percent. Decreasing the open unemployment rate can increase the national economic growth rate. According to *Center for Indonesian Policy Study (CIPS)* researchers , this 6 decline was caused by more jobs being created because it was easier to register business permits. From the point of view of raw materials, Indonesia already has it. The productive age is more than 60% of the total population and natural resources are ready to be researched and utilized for community needs (ILP, 2022).

Just imagine if the government does not immediately focus on empowering youth for research and development (R&D), it is certain that in 2025, apart from us being the biggest consumers, we will also have a large burden of unemployment (Dalilah & Primary, 2020). The productive age only becomes a burden on the state because it is not balanced with the quality of their intellect. So do not be surprised if later researchers in Indonesia are taken over by Germany, the United States, Japan and China. Our natural resources have to be transferred to other countries for processing because there is no high processing technology and qualified human resources here. This could result in the collapse of the theories and predictions of many research bodies about Indonesia in the future. Because in fact in 2025 Indonesia will not recover, but will be getting worse economically which will later spread to other sectors.

Bonuses as Innovation in Science Development with Contemporary Modeling

The demographic bonus will become a pillar of increasing the productivity of a country and a source of economic growth through productive use of human resources. This can be

achieved if the government together with the Indonesian people can take advantage of the demographic bonus starting in 2020. Of course, there are prerequisites that must be met in order to take advantage of the demographic bonus, one of which is improving the quality of Human Resources (HR) Indonesia must be adequate and able to contribute to increasing national productivity and economic growth (Al Kahar, 2021).

Demographic bonus Indonesia has a lot of potential to achieve the promise of independence. In addition to economic stability, the important thing from the demographic bonus that can be realized is strengthening Indonesia's position in science and technology in the international world. Strengthening the position of science and technology in Indonesia will also have an impact on the more stable economy in this country because natural resources have been processed by their own qualified human resources (Umar, 2017).

The demographic bonus filled with quality human resources will be a valuable asset, especially for strengthening Indonesia's science and technology position in the world. With the existence of new research and technology, it will encourage innovation in the economic sector, in the end it will realize the welfare of the nation. We have to believe that Indonesia can do it.

Learning methods are tools and techniques used as intermediaries for communication between teachers and students in the educational process at school so that students can master the field of science being studied. This is important because learning biology requires the ability to understand, solve problems, and experience being directly involved (Listiana, 2014). Therefore, teachers need to increase knowledge and competence as an effort to improve the quality of knowledge they have and strive to improve the quality of learning methods using various learning media continuously so as to make it easier for students to understand the lessons given. (Iskandar, 2019). This is part of the competencies that teachers must have, including pedagogical, personal, social and professional competencies so that they can help students achieve the expected basic competencies (Rohana, 2023).

Apart from that, strengthening teacher professional competence and student competence can be carried out through competition activities. Competition is a means of developing teacher competence and professionalism so as to assist teachers in preparing intelligent, character, competitive and competitive human beings. Competition can also spur an increase in student competency both in the fields of science, technology and mathematics so that students are able to master science well, are able to develop their talents and interests and become part of educational equity efforts (Kemendikbud, 2019). One of these competitions is the science olympiad which includes the National Science Olympiad (OSN) and the National Teacher Olympiad (OGN) (Suyanto et al., 2020).

To adapt between science, technology and their relationship in society, teachers, especially science subject teachers, should apply learning called Contextual Teaching and Learning (CTL). The CTL approach is a learning and teaching approach that links the material taught with students' real-world situations and encourages students to make connections between the knowledge they have and the examples in their lives as individuals, family members, communities and nations (Raub et al., 2015).

One approach that can be used to carry out learning in the context of society is the Science Technology *Society approach* . Learning science with the *Science Technology Society*

(STS) approach means using technology as a link between science and society (Raub et al., 2015) . In the learning process using the STS approach, issues or problems arise first which are explored from the students' approach. Being trained in doing this activity causes students to care more about the environment, be aware of the positive and negative impacts of a technology, be aware of the values espoused in society, be creative in finding problems and solving problems. This ability is often said to be an accompanying effect in learning science.

Growing and developing scientific literacy can be done early on when students are still in elementary school through science education or more precisely, namely science education with the STS approach so that it becomes a habit to respond quickly to environmental situations and be skilled at solving problems using the knowledge and concepts they have learned. through education (Aikenhead & Ryan, 1992).

The STS approach has the following characteristics: identification of problems (by students) in society that have a negative impact; using problems that exist in society that students discover that are related to natural science as a vehicle; use the resources available in society, both material and human, as resource persons for scientific information and technological information that can be applied in solving real problems in everyday life; increasing science lessons beyond classroom hours, classrooms and school buildings; increase student awareness of the impact of natural science and technology; broaden students' insight into natural science beyond something that needs to be mastered to pass an exam (eye test); involve students in seeking scientific information and technological information that can be applied in solving real problems raised in everyday life; increase students' awareness of their responsibilities as citizens in solving problems that arise in society, especially problems that are closely related to science and technology; natural science is a fun experience for students; natural science that refers to the future (Sulistyaningrum et al., 2020).

In a more fundamentally focused context, learning with a scientific approach is a learning process that is designed in such a way that students actively construct concepts, laws or principles through the stages of observing, formulating problems, proposing or formulating hypotheses, collecting data using various techniques, analyze data, draw conclusions, and communicate discovered concepts, laws or principles. In other words, scientific learning is aimed at providing students with an understanding of recognizing and understanding various materials presented based on a scientific approach (Iskandar et al., 2006).

The characteristics of scientific learning formulated by the government through the regulations of the ministry of education and culture are as follows: (1) The learning process must be logical, based on facts, data or phenomena that can be explained with certain logic/reasoning; not limited to mere guesswork, imagination, legends, or fairy tales (2) Teacher explanations, student responses, and teacher-student educational interactions are limited to immediate prejudice, subjective thinking, or reasoning that deviates from the flow of logical thinking (3) Mendoeong and inspire students to think critically, analytically, and precisely in identifying, understanding, solving problems, and applying learning material. (4) Encourage and inspire students to be able to think hypothetically in seeing differences, similarities and links to each other from the learning material. (5) Encourage and inspire students to be able to understand, apply and develop rational and objective thinking patterns in responding to learning material. (6) Based on concepts, theories and empirical facts that can be accounted for. (7) The learning

objectives are formulated simply and clearly, but the presentation system is interesting (Iskandar et al., 2006).

If you look at the series of existing activities, learning with a scientific approach is learning that provides students with the opportunity to freely develop all the potential they have. The role of the teacher in this approach is as a director and provider of reinforcement for the results found by students. In this way, students will gain an impressive learning experience obtained from a series of activities contained in the scientific approach. In a scientific approach, the final result is not a benchmark for making an assessment but starts from the process of observing at the beginning of the activity.

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