



## TRANSFORMATION OF 21ST CENTURY EDUCATION TO REALISE SUPERIOR HUMAN RESOURCES TOWARDS THE GOLDEN GENERATION

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### ABSTRACT

*The transformation of 21st century education is the main key in shaping superior human resources (HR) to realise the Golden Generation 2045. This research uses the literature review method to examine the concepts, challenges, and strategies of educational transformation in the digital era. The results show that 21st century education requires mastery of critical thinking skills, creativity, collaboration, communication, digital literacy, and character strengthening. However, the implementation of education transformation still faces challenges in the form of gaps in access, education quality, teacher readiness, and equitable distribution of technological infrastructure. To overcome these obstacles, a comprehensive strategy is needed in the form of equalising access to education, adaptive curriculum reform, improving teacher competence, and cross-sector collaboration. Adaptive, innovative and characterful education transformation is believed to be able to produce superior human resources who are ready to compete at the global level and contribute positively to the progress of the nation.*

**Keywords:** educational transformation, 21st century, superior human resources, golden generation, literature review.

### INTRODUCTION

Education is the main foundation in building a nation's civilisation. Throughout history, education has always changed following the times, both in terms of goals, methods, and learning content. Entering the 21st century, the world faces increasingly complex global challenges, such as technological advances, globalisation, and very dynamic socio-cultural changes (Judijanto & Aslan, 2025). This condition requires the transformation of education to be able to produce human resources (HR) that are relevant to the needs of the times and able to compete at the global level (Purike & Aslan, 2025).

The 21st century is known as the era of technology, information and digitalisation. The rapid development of technology has affected almost all aspects of human life,

including education. The learning process is no longer limited to conventional classrooms, but has been integrated with various technological devices that allow access to information widely, quickly and easily. This requires the education system to adapt and accommodate these changes so as not to be left behind by the times (Firmansyah & Aslan, 2025a).

The transformation of 21st century education is not just a change in curriculum, but also a shift in the learning paradigm. From teacher-centred to student-centred, it emphasises the development of critical thinking, creativity, communication and collaboration (4C) skills. These four skills are key in facing the challenges and opportunities in the era of globalisation and industrial revolution 4.0 (Firmansyah & Aslan, 2025b).



Indonesia, as the fourth most populous country in the world, has great potential in utilising the demographic bonus which is expected to reach its peak in 2045. This demographic bonus provides a golden opportunity for Indonesia to create a productive, innovative and highly competitive young generation (Sulisworo & et al, 2024). However, this opportunity can only be realised if the education system is able to transform and produce human resources that excel academically, character and 21st century skills.

21st century education requires learners to not only master basic knowledge, but also be able to think logically, creatively, and adaptively to change. In addition, mastery of information and communication technology is an absolute requirement so that the younger generation can actively participate in nation building and compete internationally. Therefore, education must be able to develop the potential of students holistically, both from the cognitive, affective, and psychomotor aspects (Wijaya, 2021).

The transformation of education in Indonesia has been initiated through various policies, such as the development of competency and character-based curricula, the implementation of Curriculum 2013, and the Movers School programme initiated by the Ministry of Education, Culture, Research and Technology. These programmes aim to create a learning environment that is innovative, creative, and adaptive to the times, so as to produce graduates who are competent, have character, and are ready to face global challenges (Puspa et al., 2023).

One of the main characteristics of 21st century education is the utilisation of digital technology in the learning process. The presence of the internet, computers and mobile devices has opened up unlimited

access to information, allowing learners to learn anytime and anywhere. However, the utilisation of technology also requires good digital literacy so that learners can sort out valid information and avoid misuse of technology (Peni & Ningsih, 2024). In addition to technology mastery, 21st century education also emphasises the importance of character development and soft skills, such as integrity, responsibility, empathy and the ability to work together. Character education is an important foundation in forming a generation that is not only intellectually intelligent, but also noble and able to contribute positively to society and the nation (Alwi & Lestari, 2025).

The biggest challenge in the transformation of education in the 21st century is the gap in access and quality of education in various regions. There are still disparities between urban and rural areas, both in terms of infrastructure, human resources and learning support facilities. Therefore, collaborative efforts from the government, schools, communities and the private sector are needed to ensure equitable distribution of quality education throughout Indonesia (Wahyudi & et al., 2022)

The role of teachers in the transformation of 21st century education is vital. Teachers no longer only act as material deliverers, but also as facilitators, motivators, and innovators in the learning process. Teachers must continue to develop professional, pedagogic and technological competencies in order to be able to present learning that is relevant, interesting and in accordance with the needs of today's learners (Sahira & Ismail, 2024b). The transformation of 21st century education must also be supported by visionary and sustainable policies. The government needs to ensure adequate regulations, funding and training



programmes to support the implementation of competency and character-based education. In addition, collaboration with business and industry is essential to ensure that education graduates have skills that match the needs of the labour market (Sulisworo & et al., 2024)

Thus, the transformation of 21st century education is a strategic step to realise superior human resources towards the Golden Generation 2045. Education that is adaptive, innovative, and oriented towards character development and 21st century skills will be the main key in creating a young generation capable of bringing Indonesia into a developed, competitive, and highly civilised country in the future.

This research aims to examine in depth how the transformation of 21st century education can realise superior human resources towards the Golden Generation, using the literature review method. By understanding the concepts, challenges, and strategies of educational transformation, this research is expected to contribute to the development of a better national education that is relevant to the demands of the times.

## **METHOD**

This research uses the literature review method, by collecting, reviewing and analysing various relevant literature sources such as books, scientific journals, articles and policy documents related to the transformation of 21st century education, the development of superior human resources, and the concept of the Golden Generation. The data obtained from the literature is then critically synthesised to identify concepts, challenges, and effective strategies in realising adaptive and competitive education to support the achievement of the Golden

Generation 2045 (Elijah & Aslan, 2025) ; (Maulina, 2021).

## **RESULTS AND DISCUSSION**

### **Transformation of 21st Century**

#### **Education as the Key to the Formation of Superior Human Resources**

The transformation of 21st century education has become a central issue in the effort to build superior human resources (HR), especially in order to welcome the Golden Indonesia 2045. This educational paradigm shift is not just a curriculum update, but also involves a fundamental shift in learning methods, goals and orientation. 21st century education requires learners to master broader competencies, not only cognitive aspects, but also critical thinking skills, creativity, collaboration, and communication (4C) (Rokhmawati et al., 2025).

One of the main driving factors for the transformation of 21st century education is the rapid development of information and communication technology. Technology has changed the way we learn, access information and interact, so education must be able to integrate technology effectively in the learning process (Caroline & Aslan, 2025). With the use of technology, access to information becomes wider, learning can be done flexibly, and students can learn according to their individual needs and pace. The main characteristics of 21st century learning are student-centred, technology-based, collaborative, contextual, interdisciplinary, project-based, flexible, personalised and problem-solving oriented. The teacher acts as a facilitator and guide, no longer the only source of knowledge. This encourages students to be active, creative, and independent in the learning process (Wahyudi & et al., 2022)



The transformation of education also demands changes to the assessment system. Assessment no longer focuses only on outcomes, but also on processes, skills and character. Formative assessment, continuous feedback, and the use of technology in assessment are an important part of 21st century education.

21st century education emphasises the importance of soft skills and character development. Values such as integrity, responsibility, empathy, and the ability to work together become the foundation in shaping a generation that is not only academically smart, but also has strong character and is ready to face global challenges. This character education is integrated in every aspect of learning. Indonesia's demographic bonus is a great opportunity to create superior human resources. The young generation at productive age must be prepared with 21st century skills to be able to compete at the national and global levels. Education is key in optimising the potential of this demographic bonus (Puspa et al., 2023).

The implementation of 21st century education transformation in Indonesia has been carried out through various policies, such as the development of the 2013 curriculum and Merdeka Curriculum. Both curricula emphasise competency development, character, and technology integration in learning (Mulyasa, 2013). The government also encourages continuous teacher training to be able to deliver innovative and relevant learning. However, major challenges are still faced in this transformation process. Disparities in access and quality of education in various regions, limited technological infrastructure, and teacher readiness are obstacles that must be overcome together. Collaboration between the

government, schools, communities and the private sector is needed to ensure equitable distribution of quality education (Wahyudi & et al., 2022)

In addition, the transformation of 21st century education also requires a change in mindset from all education stakeholders. Education is no longer only orientated towards the mastery of material, but also on the development of the potential, talents, and interests of learners in accordance with the needs of the times. Education must be able to create an inclusive, adaptive and innovative learning environment.

The implementation of project-based learning is one of the effective strategies in 21st century education. Through projects, students can develop critical thinking, problem solving, cooperation, and communication skills in real time. Contextual learning that relates material to everyday life also helps students understand the relevance of science (Sahira & Ismail, 2024b).

The integration of technology in education is not only limited to the use of hardware and software, but also to the development of digital literacy. Students must be equipped with the ability to sort out information, think critically about digital content, and understand ethics in the use of technology. Digital literacy is one of the main competencies in facing the information age (Holmes, 2024).

21st century education also demands flexibility in the time and place of learning. Learning is no longer limited to conventional classrooms, but can be done online or offline, according to the needs and conditions of each student. This opens up opportunities for all the nation's children to gain wider access to education (Sahira & Ismail, 2024b).

Curriculum development that is adaptive and responsive to the times is a must.



The curriculum must be able to accommodate the changing needs of the world of work, technological developments, and the demands of the global community. A relevant curriculum will help students prepare for an uncertain future (Cahyono & Aslan, 2025).

The role of teachers in the transformation of 21st century education is vital. Teachers must continue to improve their pedagogic, professional and technological competencies in order to become agents of change in education. Teacher training and professional development need to be supported continuously by the government and educational institutions. The transformation of 21st century education must also pay attention to inclusivity and equity. Every child, regardless of social, economic or geographical background, has the right to quality education that can optimally develop their potential. The government needs to ensure that no child is left behind in this transformation process (Aslan & Rasmita, 2025).

Thus, the transformation of 21st century education is the main key in the formation of superior human resources towards the Golden Generation 2045. Education that is adaptive, innovative, and oriented towards character development and 21st century skills will produce a generation that is smart, competitive, and has strong character, ready to compete in the era of globalisation and industrial revolution. Therefore, the transformation of 21st century education is an important foundation in realising superior human resources that are able to compete at the global level and answer future challenges. Through the development of 4C skills, technology integration, character strengthening and learner-centred learning, 21st century education can create a golden

generation that is innovative, adaptive and highly competitive. However, the success of this transformation depends on the collaboration of all stakeholders, equitable access, and sustainable policy support so that every Indonesian child can develop optimally and contribute to building the nation towards a Golden Indonesia 2045.

### **Challenges and Strategies Towards the Golden Generation**

Challenges and strategies towards the Golden Generation 2045 are very important strategic issues in Indonesia's national development map. To realise the golden generation, education is the main foundation that must be strengthened thoroughly and sustainably. However, various challenges are still faced by the national education system, both in terms of access, quality, relevance, and readiness to face rapid global changes (Holmes, 2024).

One of the main challenges is the gap in access to education across Indonesia. Many remote and outermost areas have not received adequate educational facilities, both in terms of infrastructure, teaching staff, and supporting technology. This inequality has an impact on differences in the quality of graduates and the opportunity for children to develop optimally. In addition to access, the quality of education is also a serious problem (Puspa et al., 2023). Many schools still lack facilities and infrastructure, as well as qualified teaching staff. The welfare of teachers in certain areas is also still low, thus affecting their motivation and performance in educating the nation's next generation. Teachers as the spearhead of education must receive special attention, both in terms of training, incentives, and continuous





professional development (Alwi & Lestari, 2025).

Curricula that are not fully relevant to the needs of the times are also a challenge. Curricula that are too focused on memorisation and have not developed critical thinking skills, creativity, collaboration, and digital literacy make graduates less prepared to face the world of work and the challenges of the 21st century. Curriculum reforms that are adaptive and responsive to global developments are needed so that education can produce competent and relevant human resources (Sahira & Ismail, 2024a).

The development of information and communication technology brings both challenges and opportunities. On the one hand, technology can expand access and improve the quality of learning through online and digital platforms. However, on the other hand, there are still many schools that do not have adequate technology facilities, as well as students and teachers who do not have sufficient digital literacy (Setyawan, 2025). Adaptation to technological advances is a must so that education is not left behind by the times. In addition to internal challenges, globalisation also requires Indonesian education to be able to equip students with cross-cultural understanding, foreign language skills, and skills to work together in an international context. Education must encourage the formation of global thinking and inclusive character, so that the younger generation is ready to compete at the world level (Hasibuan., 2016)

Another important challenge is character building and strengthening national values. Education should not only be orientated towards academic aspects, but should also be able to instil integrity, responsibility, empathy, and leadership in students. Character education is the

foundation in building a golden generation that is not only smart, but also noble and has a national perspective (Wahyudi & et al., 2022)

Facing these challenges requires a comprehensive and integrated strategy. One of the main strategies is equitable access to education through infrastructure development, provision of adequate facilities and infrastructure, and increasing the education budget. The government must ensure that every Indonesian child, wherever they are, has the same opportunity to get a quality education (Mulyasa. , 2013)

Improving the quality of teachers is the next key strategy. Teachers need to be provided with continuous training and professional development, including training in the utilisation of technology and the development of innovative learning methods. Incentives and rewards for outstanding teachers also need to be increased to encourage their motivation and dedication in educating the younger generation (Suryadi & Aslan, 2025).

Curriculum reform must continue to be carried out to be in line with the needs of the 21st century. Curriculum that emphasises the development of 4C skills (critical thinking, creativity, collaboration, communication), digital literacy, and character must be implemented consistently at all levels of education. The Merdeka Curriculum, for example, is one innovation that can strengthen 21st century skills for Indonesia's golden generation (Holmes, 2024).

Optimal utilisation of education technology is also an important strategy. The development of online learning platforms, educational applications and digitisation of learning resources can help overcome geographical limitations and improve the quality of learning. However, it is necessary to ensure that all levels of society can access



these technologies equally. Cross-sector collaboration between government, businesses, communities and educational institutions should be strengthened (Sitopu et al., 2024). These partnerships can provide additional resources, expand networks, and create innovations in the education system. The synergy of various parties is essential to create a conducive and sustainable education ecosystem (Guna et al., 2024).

Character education and the strengthening of national values must continue to be integrated in every learning process. Through character education, the younger generation will have a strong moral foundation, enabling them to become future leaders with integrity and responsibility. Another important strategy is to strengthen the education evaluation and supervision system. Periodic evaluations of policies, curricula and learning processes need to be conducted to ensure the effectiveness and relevance of education to the needs of the times. Evaluation results can be the basis for improvement and development of the education system in the future (Iksal et al., 2024).

With the various challenges and strategies that have been identified, the hope of realising the Golden Generation 2045 remains wide open. Quality, equitable, relevant and characterful education will be the main key in producing superior human resources who are ready to compete at the global level and contribute to the progress of the nation (Fawait et al., 2024).

In conclusion, the challenges of education towards the Golden Generation 2045 include access gaps, education quality, curriculum relevance, technology readiness, and character building. Strategies to overcome them include equitable access to education, improving teacher quality, curriculum reform,

technology utilisation, cross-sector collaboration, strengthening character education, and an effective evaluation system. With planned and collaborative efforts from all stakeholders, the grand vision of a Golden Indonesia 2045 can be realised through superior and highly competitive education.

## CONCLUSION

The transformation of 21st century education is a strategic foundation in the effort to realise superior human resources towards the Golden Generation 2045. Through the development of 21st century skills such as critical thinking, creativity, collaboration, communication, as well as technology integration and character strengthening, education is able to prepare young people who are adaptive, innovative, and ready to compete at the global level. Learner-centred and technology-based learning is key in building human resources that are relevant to the demands of the times.

However, this transformation process still faces various challenges, such as disparities in access and quality of education, teacher readiness, and equitable distribution of infrastructure and digital literacy. To overcome these obstacles, a comprehensive strategy is needed in the form of equalising access to education, adaptive curriculum reform, improving teacher competence, and cross-sector collaboration between the government, the business world and the community. These efforts must be supported by visionary and sustainable policies so that educational transformation can run optimally throughout Indonesia.

Thus, the successful transformation of 21st century education determines the achievement of the vision of the Golden Generation 2045. Adaptive, innovative and



characterful education will produce superior human resources who are not only intellectually intelligent, but also have integrity, competitiveness and are able to contribute positively to the progress of the nation in the era of globalisation.

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