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## The relationship between the characteristics of Generation Z and the implications of the implementation of the 21<sup>st</sup> century learning skills

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### Abstract

This research used a combined approach of quantitative and qualitative analysis to examine the relationship between the characteristics of Generation Z and the implications of implementing the 21<sup>st</sup> century learning skills. Participants were members of Generation Z who were involved in surveys and interviews. Quantitative data were analyzed using descriptive statistics and a partial correlation test, while qualitative data were analyzed through a thematic approach. The results showed a significant relationship between the characteristics of Generation Z and the implications of implementing 21<sup>st</sup> century learning skills. The relationship is evidenced by the partial correlation coefficient of 0.615 (61.5%) with probability ( $P = 0.002$ ). This explains that Generation Z characteristics, such as learning preferences, learning styles, and understanding of 21<sup>st</sup> century skills, are interrelated and have an impact on how they interact with learning.

### Keywords

Characteristics, Generation Z, learning skills, relationships

### Article History

Received 19 November 2023

Accepted 05 August 2025

### How to Cite

Efendi & Anwar, S. (2025). The relationship between the characteristics of Generation Z and the implications of the implementation of the 21<sup>st</sup> century learning skills. *Indonesian Research Journal in Education | IRJE |*, 9(2), 1175 - 1187. <https://doi.org/10.22437/irje.v9i02.29456>

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## Introduction

The entry of the 21<sup>st</sup> century is marked by the emergence of the Industrial Revolution 4.0 era, which has transformed it into an era of openness and globalization. During this period, Indonesia entered the Industrial Revolution 4.0 era, which is expected to open wider and more job opportunities and advance the human work process to be more efficient, faster, and more satisfying. The evidence suggests that human life in the 21<sup>st</sup> century has undergone significant changes, with increasing demands for superior quality human resources in all fields and work results (Rasca, 2017). This change is a reality that everyone cannot avoid.

As is known, the 21<sup>st</sup> century has experienced a total transformation in social structure, environment, and daily routines. Several examples of these rapid changes can be observed in the realm of information technology and digital technology, primarily through the widespread adoption of social networks or social media, which have become a standard part of various levels of society, regardless of social and economic status (Sundararajan et al., 2013).

A significant transformation occurs in everyday life in response to current developments. In particular, the most significant changes occur in the education sector (Facer, 2011). Digital technology has changed the way people interact, work, and learn. One of the groups most affected by this change is Generation Z. Generation Z, also known as digital natives or the net generation, is a group of individuals born between the mid-1990s and early 2010s (Arief & Haryadi, 2019). They grew up and developed in the digital era, marked by rapid advances in information and communication technology. This results in distinctive characteristics in their learning, where information is readily available and knowledge can be obtained with just a few taps on the screen. In implementing 21<sup>st</sup> century learning skills, Generation Z has unique characteristics that can influence practical learning approaches. These learning skills, which include problem-solving, teamwork, creativity, critical thinking, communication, and digital literacy, are key to preparing this generation to face increasingly complex future challenges (Reaves, 2019). Therefore, research on the relationship between Generation Z characteristics and the implications of implementing 21<sup>st</sup> century learning skills is relevant to optimizing their learning experience.

A literature review shows that Generation Z is a group that grew up amidst technological advances, where access to information, social media, and mobile devices has become an inseparable part of their daily lives (Mansur & Ridwan, 2022). They have outstanding multitasking skills, can adapt quickly to technological changes, and tend to utilize digital resources to obtain information. However, these characteristics are also accompanied by challenges, such as rapid loss of attention and the potential lack of in-depth problem-solving skills (Graesser et al., 2018).

The characteristics of Generation Z have significant implications for the implementation of 21<sup>st</sup> century learning skills. First, when it comes to creativity, Generation Z tends to think creatively and seek innovative solutions to problems. Generation Z positively responds to environments that foster experimentation and new ideas (Wajdi et al., 2024).

Second, digital literacy is a crucial element in the learning of Generation Z. They grow up in a digital environment rich in information and potential distractions. Therefore, they must be empowered to become critical information consumers, sorting, filtering, and analyzing information wisely. Education must involve digital literacy as a core skill in dealing with the overwhelming flow of information (Leaning, 2019).

Third, collaborative learning and teamwork become more meaningful for Generation Z. In this context, it is important to understand how the unique characteristics of Generation Z influence educational approaches, especially in the application of 21<sup>st</sup> century learning skills. Therefore, a profound understanding of how Generation Z characteristics influence the application of 21<sup>st</sup> century learning skills is essential in developing effective learning approaches.

No previous research has examined the impact of Generation Z characteristics on learning and the development of 21<sup>st</sup> century skills. By understanding Generation Z's learning preferences, learning styles, and skill tendencies, people can develop learning approaches that align with their needs. This research is also expected to contribute to developing learning innovations that can utilize the potential of digital technology without ignoring the importance of 21<sup>st</sup> century skills such as critical thinking, collaboration, communication, and problem-solving. Thus, it is hoped that this research can contribute to developing a learning model that is more responsive to the characteristics of Generation Z and produces graduates ready to face future challenges. The entry of the 21<sup>st</sup> century is marked by the emergence of the Industrial Revolution 4.0 era, which has transformed it into an era of openness and globalization. In this period, Indonesia entered the era of the Industrial Revolution 4.0, which is expected to open wider and more job opportunities and advance the human work process to be more efficient, faster, and more satisfying. The literature suggests that human life in the 21<sup>st</sup> century has undergone significant changes, with increasing demands for superior quality human resources in all fields and work outcomes (Finegold & Notabartolo, 2010). This change is a reality that everyone cannot avoid. As is known, the 21<sup>st</sup> century has experienced a total transformation in social structure, environment, and daily routines.

## Literature Review

### *Characteristics of generation Z*

Generation Z, commonly defined as individuals born between the mid-1990s and early 2010s, represents the first generation to be fully immersed in digital technology from birth. Several studies emphasize that Generation Z exhibits unique characteristics compared to previous generations, particularly in their cognitive styles, learning preferences, and social interactions. According to Gawda and Korniluk (2022), Generation Z students demonstrate strong multitasking abilities, high levels of digital literacy, and an inclination toward visual learning. This behavior is primarily because their formative years have coincided with the rapid development of the internet, smartphones, and social media platforms.

Furthermore, Ordun et al. (2021) described Generation Z members as pragmatic, entrepreneurial, and socially conscious. When technology integrates, they not only value individuality but also thrive in collaborative environments. Their reliance on digital tools

fosters independence in accessing information, yet it also introduces challenges, such as reduced attention spans and a preference for immediate feedback (Shatto & Erwin, 2016).

Another defining trait of Generation Z is their global outlook. Due to the borderless nature of the digital world, Generation Z students are more likely to be exposed to diverse cultures, ideologies, and knowledge sources (Seemiller & Grace, 2017). This exposure shapes their worldview, creating learners who are adaptive and open-minded. However, such exposure also requires educators to provide structured guidance to help them filter credible information from misinformation—a critical skill in the era of information overload.

In the context of education, these characteristics necessitate a rethinking of pedagogical approaches. Traditional lecture-based methods often fail to engage Generation Z learners, who prefer interactive, technology-rich, and student-centered learning environments (Li et al., 2024). Hence, understanding the characteristics of Generation Z is crucial for implementing effective 21<sup>st</sup> century learning strategies.

### ***Concept of the 21<sup>st</sup> century learning skills***

The framework of 21<sup>st</sup> century learning skills, often called the “4Cs,” encompasses critical thinking, creativity, collaboration, and communication (Priyatni, 2019). These competencies are essential for preparing learners to succeed in an increasingly complex and rapidly changing world. In addition to the 4Cs, other frameworks, such as the Partnership for 21<sup>st</sup> century Learning (P21), include information literacy, media literacy, technology skills, and life and career skills.

Critical thinking involves analyzing, evaluating, and synthesizing information to make informed decisions. Creativity emphasizes the capacity to generate innovative ideas and solutions. "Collaboration" refers to the ability to work effectively in teams, while "communication" highlights the importance of expressing ideas across diverse contexts.

Moreover, digital literacy is a cornerstone of 21<sup>st</sup> century skills. With the ubiquity of technology, learners must not only navigate digital tools but also use them ethically and effectively. This mindset aligns closely with the natural proclivities of Generation Z, who are often described as “digital natives” (Alexei et al., 2015). However, while Generation Z is adept at using technology, research shows they may lack advanced digital literacy skills, such as evaluating online information or creating professional digital content (Wilson, 2014). Therefore, implementing 21<sup>st</sup> century learning skills requires an educational environment that integrates technology while promoting critical awareness, creativity, and collaboration.

### ***Relationship between generation Z characteristics and 21<sup>st</sup> century skills***

The alignment between Generation Z characteristics and the demands of 21<sup>st</sup> century learning skills is both complementary and challenging. On one hand, Generation Z’s natural digital fluency, preference for collaborative learning, and global orientation support the acquisition of 21<sup>st</sup> century competencies. On the other hand, their tendencies toward distraction, shortened attention spans, and overreliance on technology can hinder the development of deep critical thinking and sustained problem-solving abilities.

Hernandez-de-Menendez et al. (2020) highlighted that Generation Z students perform best in learning environments that integrate technology, promote experiential learning, and provide immediate feedback. Such environments are conducive to developing communication and collaboration skills. Similarly, their comfort with digital platforms can be leveraged to foster creativity, particularly through multimedia projects, online discussions, and problem-based learning.

However, the gap lies in critical thinking and resilience. Many educators observe that Generation Z learners prefer structured guidance and may struggle with ambiguity or long-term projects (Kamp, 2023). This indicates that while their characteristics align with the surface-level aspects of 21<sup>st</sup> century skills, intentional instructional design is necessary to cultivate deeper cognitive and metacognitive competencies.

### Methodology

This research was designed to investigate the relationship between Generation Z characteristics and the implications of implementing 21<sup>st</sup> century learning skills. The research design used was an integrated qualitative and quantitative research. This approach allowed us to combine qualitative and quantitative data to better understand Generation Z learning preferences and their implications for 21<sup>st</sup> century learning skills. The data sources in this research consisted of two types, namely primary data and secondary data. Primary data were obtained through a survey given to Generation Z respondents randomly selected from various backgrounds and environments. This survey was designed to identify Generation Z's learning preferences, learning styles, and skill tendencies. In addition, primary data were also obtained through in-depth interviews with several respondents selected based on the survey results. This interview aimed to gain deeper insight into how Generation Z characteristics can be integrated into developing 21<sup>st</sup> century learning skills. Secondary data in this research were obtained through literature relevant to the research topic, including previous studies examining Generation Z characteristics and 21<sup>st</sup> century learning skills. This secondary data were used as a theoretical basis for developing a conceptual framework and research hypotheses.

The data collection technique for this survey used an online questionnaire distributed to Generation Z respondents via social media platforms and email. This questionnaire was designed with structured questions covering learning preferences, the use of technology in learning, and perceptions of 21<sup>st</sup> century learning skills. Furthermore, data collection method for interviews data collection technique was carried out through in-depth interviews using open-ended question guides, which allowed respondents to explain their views in more detail.

The data obtained from the survey results were analyzed quantitatively using descriptive statistical methods, such as frequency, percentage, and mean. The results of this analysis provided an overview of learning preferences, learning styles, and skills more dominant in Generation Z. To determine the correlation between the independent variable (X) and the dependent variable (Y), partial correlation and simple linear analysis techniques were used. Furthermore, qualitative data from the interview results were analyzed using a thematic approach, where data were categorized and analyzed to identify patterns and central themes that emerge from the interview results.

By combining the quantitative and qualitative analysis results, this research produced a deeper understanding of the relationship between Generation Z characteristics and the implications of implementing 21<sup>st</sup> century learning skills. Thus, this research is expected to guide the development of more effective and responsive learning strategies for Generation Z's needs in developing 21<sup>st</sup> century skills.

### Results and Discussion

The results of this research present the findings of the analysis related to the research question, namely, testing the relationship between the characteristics of Generation Z and the implications of implementing 21<sup>st</sup> century learning skills. Through quantitative and qualitative data analysis, this research seeks to provide a more profound understanding of learning preferences, learning styles, and dominant skills in Generation Z. The quantitative analysis revealed diverse learning preferences in Generation Z, as illustrated in Table 1 below:

**Table 1.** *Descriptive statistics results*

Variables	Frequency	Percentage
Learning Preferences		
Visual	120	40%
Auditory	80	26.7%
Kinesthetic	100	33.3%
Learning Styles		
Visual	110	36.7%
Auditory	90	30%
Kinesthetic	90	30%
21 <sup>st</sup> Century Learning Skills		
Critical Thinking	150	50%
Collaboration	130	43.3%
Communication	140	46.7%
Solutions to problems	160	53.3%

The results of the descriptive statistical analysis obtained from the table above provide an in-depth overview of the learning preferences, learning styles, and skills that are more dominant in Generation Z. This analysis offers an insightful perspective on how Generation Z interacts with learning and how their characteristics can impact the application of 21<sup>st</sup> century learning skills. Regarding learning preferences, the research results indicate that Generation Z has diverse learning preferences. Most (40%) prefer visual learning, where using images, diagrams, and graphs is the primary key to learning. Meanwhile, around 26.7% of respondents are more inclined towards auditory learning, where hearing and listening to information are more important. Not to be missed, as many as 33.3% of respondents are more inclined towards kinesthetic learning, which involves physical movement and direct interaction with learning materials. These results underscore the significance of diverse learning approaches in catering to Generation Z's diverse learning preferences.

The data show that Generation Z also has varying tendencies regarding learning styles. As many as 36.7% of respondents identify as visual learners who find it easier to understand and remember information through images or visualizations. As many as 30% stated that the auditory learning style is the most suitable for them, where listening to explanations and discussions is an effective way to understand the material. In addition, another 30% prefer the kinesthetic learning style, which requires physical interaction and direct experience with the material. This diversity of learning styles underscores the need for a diverse and inclusive learning approach to stimulate profound understanding.

The analysis results also provide intriguing insights when exploring 21<sup>st</sup> century learning skills that are more dominant in Generation Z. In the context of critical thinking, as many as 50% of respondents showed awareness of the importance of this ability in the learning process. Critical thinking skills are an important foundation in analyzing, evaluating, and formulating solutions to complex problems. In addition, collaboration skills are also a significant focus, with 43.3% of respondents acknowledging the importance of working together in groups or teams to achieve common goals. This indicates Generation Z's adoption of cooperation and social interaction through digital technology.

Furthermore, regarding communication skills, the research results showed that 46.7% of respondents realized the importance of this ability in conveying ideas and information effectively. In an era where digital communication is increasingly dominant, communicating accurately and persuasively is a highly valued skill. Finally, in terms of problem-solving, 53.3% of respondents acknowledged the need for this skill. Problem-solving is closely related to creativity and the ability to proactively face challenges, which are key in dealing with change and uncertain situations. Combining the analysis results of these three aspects shows that Generation Z have diverse learning preferences, learning styles, and skills. This emphasizes the importance of a diverse and inclusive learning approach, accommodating everyone's unique preferences and needs. The implications of Generation Z characteristics for applying 21<sup>st</sup> century learning skills are also very real. Baskoro et al. (2023) revealed that critical thinking, collaboration, communication, and problem-solving skills emerged as skills that must be strengthened in the Generation Z learning approach. Furthermore, to find out whether there is a relationship between the independent variable X and the dependent variable, a partial correlation analysis ( $r_{y.1}$ ) was carried out by controlling one of the independent variables (Generation Z characteristic variables), then the correlation of Generation Z characteristic variables with the implications of the application of 21<sup>st</sup> century learning skills can be explained.

The calculation results show an R-value of 0.61537. To determine the significance of the relationship, a t-test was conducted, resulting in a t-value of 3.517 and a p-value of 0.002 < 0.05. The test criteria are that the relationship is significant if the p-value is < 0.05. Thus, the hypothesis can be concluded that there is a significant relationship between the characteristics of Generation Z and the implications of implementing 21<sup>st</sup> century learning skills ( $H_0$  is rejected). In qualitative data analysis, the central theme that emerged from the interviews was the respondents' preference for using technology in learning. Many respondents stated that technology is integral to their daily lives, and they feel more comfortable learning through digital platforms. They emphasized that images, videos, and interactive simulations facilitate understanding and retention of information. One respondent

stated, "I prefer to learn through videos or online platforms because I can see clear visualizations of difficult material."

In addition, the theme of collaboration and social interaction also emerged in qualitative data analysis. Although Generation Z grew up with digital technology that is often individualistic, many realize the importance of learning in groups or teams. They felt that discussing with peers or collaborating on a project could help them gain a broader perspective and deepen their understanding. One respondent said, "I like studying with friends in a group because we can share ideas and help each other solve problems."

Regarding 21<sup>st</sup>-century learning skills, the interview results highlighted the importance of critical thinking and problem-solving skills. Many Generations Z recognize that information in the digital age can be vast and diverse, so they need to develop the ability to sort and evaluate information critically. Analytical thinking is also crucial in navigating complex situations. One respondent explained, "I learn to look at information from various sources and formulate my opinion before deciding what is right."

Through a thematic approach to qualitative data analysis, the researchers understood how Generation Z's preferences, learning styles, and core skills are interrelated and reflected in how they interact with learning. These findings significantly strengthen the results of previous quantitative analyses. The findings offer an explanation about why Generation Z prefer visual learning, how their learning styles influence their preferences in using technology, and how 21<sup>st</sup> century skills respond to the demands of fast and complex information.

## Discussion

Analyzing Generation Z's learning preferences, styles, and skills yields important insights into the evolving educational landscape in the 21<sup>st</sup> century. Using quantitative and qualitative data, this discussion examined the varied characteristics of the nature of Generation Z's educational needs and their implications for educational approaches and strategies.

***Diverse learning preferences and styles***, generation Z is characterized by diverse learning preferences and styles, reflecting the impact of the digital age on their upbringing. Quantitative data suggests that this generation exhibits varying tendencies in critical thinking, collaboration, communication, and problem-solving skills. This illustrates the value of accommodating these unique preferences and needs in education. As Wajdi et al. (2024) argued, Generation Z learning approaches should emphasize developing these 21<sup>st</sup> century skills, as these skills are essential in navigating the complexities of the modern world.

***Embracing technology in learning***, qualitative data analysis revealed that one of the dominant themes among Generation Z learners is their strong preference for technology-mediated learning. Many of them view technology as an integral part of their daily lives and are comfortable using digital platforms for education. They emphasize the value of visual aids, videos, and interactive simulations in enhancing comprehension and retention of information. This preference aligns with their exposure to technology from a young age and reinforces the importance of integrating technology into educational practices. The importance of technology in their learning experience is further highlighted by their reliance on clear visualizations of complex material. They gravitate toward video-based learning and online platforms, where visual representations aid comprehension. One respondent said, "I prefer

learning through videos or online platforms because I can see clear visualizations of difficult material.” This fact underscores the need for educators to incorporate multimedia elements into their teaching strategies to meet this preference effectively.

***Collaboration and social interaction***, contrary to the stereotype of a screen-focused generation, qualitative data revealed that many Generation Z individuals recognize the value of collaboration and social interaction in their learning. Despite growing up in a digital age often characterized by individualism, they recognize the benefits of group learning and teamwork. Engaging in discussions with peers and collaborating on projects provide them with a broader perspective and a more profound understanding of the subject matter. One respondent said, “I like learning with friends in a group because we can share ideas and help each other solve problems. These findings demonstrate the value of developing collaborative skills among Generation Z learners. While technology plays a vital role in their education, it should not replace face-to-face interactions. Instead, educators should leverage technology to facilitate and enhance collaborative learning experiences, encouraging teamwork, communication, and idea exchange.

***The 21<sup>st</sup> century skills: Critical thinking and problem-solving***, in the context of 21<sup>st</sup> century skills, critical thinking and problem-solving skills are paramount in qualitative data analysis. Generation Z recognizes that the digital age overwhelms them with vast and diverse information. Therefore, they recognize the importance of critically evaluating and discriminating between sources of information. Analytical thinking is essential when dealing with the intricacies of complex situations. One respondent aptly explained, “I learned to look at information from multiple sources and form my opinion before deciding what is true.” This insight illustrates the value of integrating critical thinking and problem-solving into the educational curriculum. Education must equip Generation Z with the skills to navigate the information age effectively. Encouraging analytical thinking and evaluating information prepare them to make informed decisions in a world filled with data.

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perspective and a more profound understanding of the subject matter. One respondent said, “I like learning with friends in a group because we can share ideas and help each other solve problems.” These findings demonstrate the value of developing collaborative skills among Generation Z learners. While technology plays a vital role in their education, it should not replace face-to-face interactions. Instead, educators should leverage technology to facilitate and enhance collaborative learning experiences, encouraging teamwork, communication, and exchanging ideas.

***The 21<sup>st</sup> century skills: Critical thinking and problem-solving***, critical thinking and problem-solving skills are essential in qualitative data analysis within the context of 21<sup>st</sup> century skills. Generation Z recognizes the digital age, which inundates them with vast and diverse information. Consequently, they understand the importance of critically evaluating and distinguishing between sources of information. Analytical thinking is crucial when navigating the complexities of challenging situations. One respondent aptly explained, “I learned to look at information from multiple sources and formulate my opinion before deciding what is true.” This insight underscores the necessity of integrating critical thinking and problem-solving into the educational curriculum. Education must empower Generation Z with the skills to navigate the information age effectively. Promoting analytical thinking and the evaluation of information prepare them to make informed decisions in a data-rich world.

***Integrating quantitative and qualitative insights***, combining quantitative and qualitative data analysis provides a comprehensive perspective on Generation Z's characteristics and learning needs. Quantitative data present a holistic view and offer statistical support for observed trends. Meanwhile, qualitative data studies the reasons, context, and nuances behind these preferences and tendencies, explaining the ‘why’ and ‘how’ of their learning habits. When examined qualitatively, the connection between Generation Z characteristics and the implications for implementing 21<sup>st</sup> century learning skills becomes more profound. Qualitative data clarifies why Generation Z leans toward visual learning, how their learning styles intersect with technology preferences, and why they prioritize critical thinking and problem-solving. This rich understanding enhances our insight into their learning landscape.

***Implications for education***, based on these findings, educators must recognize the importance of embracing diverse and inclusive approaches to learning. One-size-fits-all pedagogy is no longer appropriate for Generation Z. Instead, educators must adapt their teaching methods to accommodate diverse learning styles, preferences, and skills. Technology integration must remain a key component of educational strategies. Because Generation Z is a digital generation, technology is not just a tool but an extension of their learning environment. Educators must leverage technology to foster engagement, creativity, and collaboration. Multimedia resources, interactive platforms, and online discussions can enhance the educational experience, which aligns with Generation Z's preferences. In addition, developing critical thinking, collaboration, communication, and problem-solving skills should be at the forefront of educational goals. These skills are essential for academic success and navigating an increasingly complex world. Education should provide opportunities for students to practice and apply these skills in real-world contexts.

The quantitative and qualitative data analysis has provided a comprehensive picture of the relationship between Generation Z characteristics and the implications for implementing 21<sup>st</sup> century learning skills. The results of the quantitative data analysis provide an overview and supporting statistics. In contrast, the qualitative data analysis provides an in-depth look at the reasons and context behind their preferences and tendencies. These findings support the need for diverse and inclusive learning approaches and the integration of technology that supports collaboration and the development of relevant 21<sup>st</sup> century skills. This research provides valuable guidance for educators in designing responsive and effective learning strategies for Generation Z, who are ready for a dynamic future.

### **Conclusions and Recommendations**

Based on the data analysis and discussion results, it was concluded that there is a significant relationship between the characteristics of Generation Z and the implications of implementing 21<sup>st</sup> century learning skills. This is evidenced by the partial correlation coefficient of 0.615 (61.5%) with a probability ( $P = 0.002$ ). This confirms that the characteristics of Generation Z, such as learning preferences, learning styles, and understanding of 21<sup>st</sup> century skills, are interrelated and impact how they interact in learning. This research provides a clear view of the need for a diverse and inclusive learning approach to meet the preferences and needs of Generation Z individuals. The implications of 21<sup>st</sup> century skills are key to answering the demands of a complex and dynamic world. Therefore, educators need to understand the characteristics of Generation Z well and design learning strategies that integrate technology, encourage collaboration, and strengthen critical thinking and problem-solving skills. As a follow-up suggestion, it is recommended that educational institutions and teachers adopt a diverse learning approach, integrate technology that supports social interaction and collaboration, and focus on the development of 21<sup>st</sup> century skills. In addition, further research can explore the impact of implementing learning strategies tailored to the characteristics of Generation Z on their academic outcomes and overall skill development.

### **Disclosure Statement**

No potential conflict of interest was reported by the authors.

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