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GENERATION Z'S MULTITASKING LEARNING STYLE AND ITS IMPLICATIONS FOR THE DEVELOPMENT OF INFORMATION SERVICE TECHNOLOGY IN LIBRARIES

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Abstract
Generation Z is known to have high multitasking characteristics in the learning process and information search. The habit of accessing various sources of information simultaneously through digital devices is a characteristic of their learning style. In the context of libraries, this multitasking behavior poses its own challenges, especially in designing information services that can accommodate the needs of this generation. This article is a literature review that aims to analyze the relationship between Generation Z's multitasking learning style and the development of information service technology in libraries. Literature sources were searched for recent studies that discuss the characteristics of Generation Z, digital multitasking behavior, and the development of information technology in the library environment. The results of the study indicate that library service technology such as online catalogs, e-resource access, flexible learning spaces, and social media integration play an important role in meeting the expectations of this generation. However, multitasking also has the potential to reduce the effectiveness of information processing, so that adaptive, personal service designs that support learning focus are needed. This study recommends that libraries develop technology-based strategies that consider the cognitive aspects of Generation Z users, in order to create a more effective and relevant learning experience. This study provides a theoretical contribution to understanding the relationship between young users' digital behavior and library information service innovation.

Keywords: *Generation Z; Multitasking; Learning Style; Information Services; Digital Library; Information Technology*

INTRODUCTION

The rapid development of information technology in the digital era has affected almost all aspects of life, including the way individuals learn and seek information. Generation Z is the group most affected by this development, because they grew up in an environment that was heavily influenced by digital devices. As a digital native generation, Generation Z has unique characteristics such as responsibility, openness, loyalty, and entrepreneurial spirit. They also show empathy and interactivity in communication. However, on the other hand, they tend to have difficulty maintaining focus, have relatively low creativity and competitiveness, and show concerns about failure (Seemiller & Grace, 2016).

One of the characteristics of Generation Z behavior is the habit of multitasking, which is accessing several sources of information simultaneously through various digital devices. This habit is considered to increase efficiency, but also poses challenges in processing information in depth. In the context of libraries, this behavior requires information services that are not only fast and flexible, but also digitally integrated. Sayekti et al. (2020) revealed that Generation Z students find it easier to understand online lecture materials, so service innovation is needed, both by lecturers and libraries, to support their learning understanding.

Library services such as online catalogs (OPAC), e-resources access, flexible learning spaces, and social media integration have become important elements that need to be continuously developed. Technology-based service strategies that consider the multitasking learning style and cognitive aspects of Generation Z are essential to make their learning experience more effective. In this case, optimizing the Learning Management System (LMS), compiling visual and interactive materials, and integrating with e-learning platforms are not just complementary, but have become a core part of the transformation of modern library services. As Generation Z's dependence on digital devices increases, libraries are required to design services that are not only technology-based, but also responsive to simultaneous and contextual learning needs. Therefore, this study focuses on analyzing the relationship between Generation Z's multitasking habits and the development of information services in libraries. This study aims to offer service design solutions that can accommodate multitasking learning styles without sacrificing learning quality, as well as provide insight for library managers in designing services that are efficient, relevant, and support the learning well-being of the digital generation.

RESEARCH METHOD

This study uses a descriptive qualitative approach with a literature research method, which is a method that focuses on collecting, analyzing, and interpreting data from relevant and credible written sources. This method was chosen because it is in accordance with the theoretical-conceptual objectives of the study, namely to analyze the relationship between Generation Z's multitasking learning style and the development of technology-based information services in libraries.

Literature searches were carried out systematically on various academic publications such as journal articles, seminar proceedings, theses, and scientific books published in the last ten years. Keywords used in the search process include Generation Z multitasking, learning style, library services, and digital information behavior. Literature sources were obtained through databases such as Scopus, Google Scholar, DOAJ, Portal Garuda, and other institutional libraries.

The selected literature must meet three main criteria: (1) explicitly discuss the characteristics of Generation Z and their multitasking tendencies, (2) review learning style theories and their classifications, and (3) reflect the practice or idea of developing innovative and technology-based library information services. The selection process was conducted in stages, starting with a review of titles and abstracts, followed by a full content evaluation to ensure their relevance and contribution to the study objectives.

The data were analyzed thematically, by identifying key patterns and issues emerging from the reviewed literature. Three main criteria developed from the literature synthesis were: (1) characteristics of Generation Z learning behavior, (2) the impact of multitasking on the effectiveness of information processing, and (3) innovative strategies in the design of digital

information services in libraries. For example, several literatures discussing the use of LMS and students' digital interactions were grouped into the third theme because they showed a link between learning preferences and the need for technology-based services.

However, this approach has limitations, especially related to the potential for bias in the literature selection. Because the selection of sources is based on topic relevance and accessibility, the possibility of subjectivity in selecting references that support certain arguments cannot be avoided. In addition, as a literature review, this study does not present direct empirical data from Generation Z users, so the results are conceptual and require further validation through empirical studies. Nevertheless, this approach still provides a strong theoretical basis for the development of library information services that are adaptive to Generation Z's multitasking learning styles and digital behaviors.

RESULT AND DISCUSSION

This discussion is designed to examine the relationship between Generation Z's multitasking learning style and library information service development strategies, as described in the research objectives. The findings are as follows:

Table 1. Results of Thematic Synthesis of Literature Review

No.	Main Criteria	Main Literature	Result	Implication
1	Characteristics of Generation Z learning behavior	*Ghufron (2019), Sayekti (2020), Rastati (2018)*	Multichannel, multitasking, digital technology-based and hands-on learning styles	Services need to be adaptive to visual, kinesthetic, and simultaneous preferences
2	The impact of multitasking on learning	*Istiana (2016),* Rosen et al. (2013), Junco (2012)	Multitasking reduces focus and depth of information processing	Interface and service design should minimize distractions and encourage focus
3	Innovative digital information service strategies	*Nicholas (2020), Sayekti et al. (2020), Nalole (2020)*	LMS integration, AR/VR utilization, social media, makerspace, and bibliotherapy	Libraries should provide hybrid services that are creative, flexible, and humanistic

Source: thematic synthesis results based on 3 main criteria

Table 1 summarizes the results of the thematic synthesis based on the analysis process carried out by identifying three main themes, namely: (1) characteristics of Generation Z learning behavior, (2) the impact of multitasking on the effectiveness of information processing, and (3) strategies for developing adaptive digital information services in libraries.

The first theme examines the tendencies of Generation Z's multi-channel and simultaneous learning behavior, as reported by Ghufron (2019), Sayekti (2020), and Rastati (2018). These three sources show that Generation Z is accustomed to using visual media, direct practice, and digital interaction as part of the learning process. Therefore, libraries are required to provide services that are responsive to the diversity of these learning preferences through a multimodal and flexible approach.

The second theme highlights the consequences of multitasking on the quality of learning. Studies by Istiana (2016) and Sparks & Honey (2017) show that uncontrolled multitasking can reduce the ability to focus and inhibit in-depth information processing. The implications of these findings point to the importance of designing library service interfaces and systems that can minimize distractions and encourage optimal learning focus.

The third theme integrates the results of studies related to digital technology-based information service strategies. Nicholas (2020), Sayekti et al. (2020), and Nalole (2020) emphasize the urgency of innovation such as the integration of Learning Management Systems (LMS), the use of Augmented Reality (AR) and Virtual Reality (VR), the use of social media as a medium for information literacy, and the development of bibliotherapy-based welfare services. These strategies support the transformation of libraries into hybrid learning spaces that are not only technology-based, but also humanistic and inclusive.

Characteristics of Generation Z Multitasking Learning Behavior

Generation Z is a generation that grew up and developed in a digital environment. They are accustomed to accessing information quickly through various devices and platforms, such as mobile phones, laptops, social media, and learning videos. This condition forms a learning style that tends to be multitasking, namely doing several activities simultaneously in the learning process, such as reading material while listening to podcasts or discussing in online groups while looking for references on the internet. This multitasking on the one hand shows Generation Z's ability to adapt to the fast and diverse flow of information. They seem more flexible in moving between topics and media, which makes the learning process feel more dynamic. However, multitasking also has another side that needs to be considered. Several studies, such as those presented by Istiana (2016), show that multitasking can reduce the level of focus and depth of understanding, because divided attention makes information processing shallower. In addition, Generation Z has varying learning style preferences. Ghufron (2019) explains that learning style is the way individuals understand and absorb information based on their respective cognitive tendencies. Meanwhile, Sayekti (2020) divides learning styles into seven types, namely visual, aural, verbal, kinesthetic, logical, social, and solitary. Although different in approach, both emphasize that learning styles are individual and need to be considered in the learning process.

Even so, the approach used by Ghufron and Sayekti seems to consider learning styles as something that is fixed and inherent in the individual. This has the potential to simplify the learning process which is actually dynamic and contextual. In addition, there have not been many studies that empirically show that adjusting learning methods to certain types of learning styles will significantly improve learning outcomes. Findings from Pashler et al. (2008) even showed that a learning style-based approach did not have a significant impact on learning effectiveness.

The implications for information services in libraries are very clear. Libraries are not enough to just provide a complete collection, but must also be able to adjust the way information is delivered to suit the learning characteristics of this generation. For example, providing material in the form of infographics or videos for visual users, as well as experimental or simulation spaces for those who are more physically active. However, an approach that places too much emphasis on tailoring services to users' learning styles also risks discouraging users from trying out other learning methods. Therefore, libraries also need to encourage users to explore different learning approaches across styles.

The Impact of Multitasking on Learning

Multitasking has become a prominent characteristic of Generation Z's learning style. They are accustomed to doing several learning activities at the same time, such as taking notes while watching learning videos, or searching for online references while discussing via instant messaging platforms. This pattern not only reflects habits, but has also become part of their way of thinking and processing information in their daily lives. By doing various tasks at once, Generation Z shows the ability to switch between sources of information and learning media without losing the main goal. This can speed up the information search process and make the learning experience feel more efficient.

However, behind these advantages, multitasking also has an impact that is not always positive on the learning process. Research from Rosen et al. (2013) and Junco (2012) shows that multitasking can disrupt concentration, increase the risk of attention disorders, and reduce the depth of information processing. When attention is divided into several tasks, the brain tends to experience task-switching costs, namely a decrease in cognitive efficiency every time focus changes.

Unfortunately, some studies that support the effectiveness of multitasking have not considered the long-term effects on information retention and understanding of complex concepts. Some of them do not even explain the specific learning context, whether multitasking is done for simple tasks or learning conceptual material that requires deeper focus. In addition, multitasking also has the potential to strengthen shallow learning behavior, namely the tendency to learn superficially, without really understanding the meaning of the information being learned. This is especially evident when multitasking is done together with the use of social media, where users are often distracted by notifications or entertainment content that is not relevant to learning activities. Some of the literature findings are also not critical enough in distinguishing between multitasking and distraction. Intentional multitasking, such as reading while listening to instrumental music, can be beneficial for some individuals. However, when multitasking involves external interruptions such as social media or instant messages, the effects on learning tend to be negative.

In addition to the cognitive aspect, multitasking can also affect the emotional aspect of the learning process. Several studies have shown that excessive multitasking can cause stress, mental fatigue, and reduce learning motivation due to the pressure to continue to be "active" simultaneously (Ophir et al., 2009). This condition certainly does not support sustainable and in-depth learning. Thus, although multitasking has become part of Generation Z's learning style, its impact on learning needs to be understood more critically and contextually. A balanced approach is needed to assess the extent to which multitasking can be utilized productively, and when it needs to be controlled so as not to disrupt the learning process. Therefore, it is important for educational institutions and information service providers such as libraries not to simply accommodate multitasking as an ideal practice. Instead, there needs to be a strategy to help users understand when multitasking is effective, and when a single focus is more needed especially in learning that requires high concentration and deep understanding.

Innovative Digital Information Service Strategy

Generation Z grew up in a digital ecosystem that encourages multitasking learning patterns, is responsive to technology, and likes visual, practical, and flexible learning approaches. Nicholas (2020) calls Generation Z digital-native learners who prioritize speed, efficiency, and convenience in the learning process. Therefore, libraries need to develop

information service strategies that are not only technologically innovative, but also pedagogically relevant to the learning rhythm of this generation. The strategies that can be applied are as follows:

1. Learning Management System (LMS) Integration

   LMS integration into the library service system is an important strategy in responding to the needs of Gen Z. LMS enables the management of digital teaching materials, online discussions, and self-evaluation that supports multitasking, independent, and visual-kinesthetic learning styles (Sayekti et al., 2020; Nicholas, 2020). As implemented at IPB University, LMS has been used effectively in managing digital learning that is directly connected to library collections. Then, Nicholas (2020) emphasized that Gen Z wants an integrated learning ecosystem between catalogs, digital modules, and visual media. Therefore, LMS integration can include connecting the library catalog with Moodle or Google Classroom, collaboration between librarians and lecturers in compiling digital modules, and information literacy training through LMS.

   However, the technical readiness and digital competence of librarians are important requirements for the success of this integration. If not planned carefully, LMS can become an additional system that burdens users, not facilitates access.

2. Utilization of AR and VR

   Augmented Reality (AR) and Virtual Reality (VR) technologies provide immersive and visual learning experiences. This supports the learning style of Generation Z who prefer simulation-based learning and hands-on practice (Sayekti et al., 2020). In the context of libraries, AR and VR can be used for library orientation tours, laboratory simulations, historical exploration through digital exhibitions, and educational game-based information training. Nicholas (2020) stated that Gen Z is more responsive to interactive media and problem solving in an active learning environment.

   However, the use of this technology requires hardware readiness, staff training, and ongoing digital content curation. Without strategic support and readiness, VR/AR could be at risk of becoming a showcase project without having a significant impact.

3. Makerspace and Creative Zone

   Makerspace and creative zones are now an important part of the transformation of modern libraries, especially in supporting practice-based and collaborative learning. This approach is very suitable for the characteristics of Gen Z who tend to be active, visual, and kinesthetic (Nicholas, 2020; Sayekti et al., 2020). Facilities such as 3D printers, digital design tools, and flexible discussion spaces allow students to explore ideas, build projects, and create digital content independently or together. Research by Nalole (2020) also revealed that Gen Z students usually bring more than one device to the library, indicating the need for adaptive spaces, both physically and digitally. However, despite its great potential, the use of makerspaces has not been fully distributed among students. In practice, these spaces tend to be dominated by groups of users who already have technological competence or come from certain creative communities. This inequality risks reinforcing the digital divide, where only some users feel “worthy” and confident to use library technology. Webb (2024), in his study of the development of spaces and collections in academic libraries,

emphasized that creating inclusive spaces is not enough just by providing technology. Active intervention is also needed in the form of training, technical guidance, and curatorial strategies that are friendly to users from various backgrounds. According to him, the presence of librarians as active facilitators is very important to bridge the skills gap, as well as build a social environment that supports broad participation. Without this approach, makerspaces run the risk of becoming exclusive spaces that only serve a limited audience.

4. Social Media as a source of information and interaction

   For Generation Z, social media is not just a communication tool, but part of the daily information ecosystem. Born and raised in the digital era, they are very responsive to visual, short, and interactive content (Nicholas, 2020). Therefore, libraries need to position social media not only as a promotional tool, but also as the main channel for delivering information, digital literacy, and user interaction space. Platforms such as Instagram, TikTok, and YouTube allow libraries to deliver collection information, tutorials, or services through interesting microlearning content. In addition, interactive features such as polls, comments, and live broadcasts encourage two-way communication and build an active digital community. Nalole (2020) emphasized that Gen Z students rely more on mobile devices and are rarely exposed to conventional media, so social media-based delivery is much more effective.

   However, social media integration also requires an inclusive and sustainable communication strategy. Librarians must understand the dynamics of digital content so that it is not just present on the platform, but is truly relevant and adaptive to the information consumption patterns of the digital-native generation. If not managed strategically, library social media is at risk of becoming repetitive, losing educational substance, or simply imitating viral styles without a clear direction. In addition, efforts need to be made to reach groups of students who are less active on social media or have different learning preferences.

5. Open Access and Open Library for the Digital-Native Generation

   The concept of open access and open library is becoming increasingly relevant in responding to the needs of Generation Z who are multitasking, digital-native, and highly dependent on technology-based information access (Sayekti et al., 2020). This generation demands the availability of learning resources that are fast, flexible, and free from space and time barriers. The open access system allows students to access journals, e-books, and research data at no cost, supporting their preferred exploratory and project-based learning styles (Nicholas, 2020).

   Moreover, the open library approach emphasizes active user participation, openness of sources, and integration of digital services such as institutional repositories and online consultations that enable students to remain productive inside and outside the library (Nalole, 2020). Báez et al. (2024) emphasized that access to learning materials must be understood as an issue of social justice, not merely service efficiency. This means that openness of information must be designed to reach all levels of students, including those who are economically vulnerable or less familiar with digital infrastructure.

   However, the adoption of this concept also requires the readiness of libraries in terms of digital infrastructure, librarian training, and the preparation of inclusive access policies. Without it, the spirit of openness risks becoming just a jargon, without truly expanding access and participation in information. Therefore, the

principles of open access and open libraries are not only technological strategies, but also a transformation of values towards libraries as collaborative and democratic learning spaces for all students.

6. User Welfare Services

   Generation Z not only needs academic space, but also spaces that support psychological well-being. Nalole (2020) shows that services such as game corners, bibliotherapy, and counseling rooms are important elements in maintaining the mental health of users. Istiana (2016) emphasized the importance of libraries as spaces for recovery and reflection. However, the implementation of psychological well-being services in libraries is not without challenges. Ideal inter-unit collaboration is often hampered by differing visions, limited resources, and complex institutional bureaucracies. In addition, clear operational standards are important to avoid overlap with campus health services, but they also have the potential to limit flexibility and innovation in designing services that are responsive to the specific needs of users. Libraries must be able to clearly negotiate their roles and build effective synergies with health units, without losing their identity as inclusive and welcoming spaces. Without strong coordination mechanisms and open communication, the well-being services offered may be merely symbolic and have little impact on the real well-being of users.

CONCLUSION

The results of the study show that Generation Z is accustomed to learning simultaneously using various digital media, so libraries need to adjust their services by providing flexible, interactive, and technology-based systems. Services such as integration with LMS, use of social media, creative spaces, and mental well-being programs are considered important to support the learning process of this generation. This study theoretically enriches the understanding of the relationship between digital-native learning characteristics and the design of relevant information services in libraries. However, as a literature study, this study has not involved direct data from Generation Z users, so these findings are conceptual. Therefore, further field-based research is needed to test how this service strategy works in real situations. A broader and more contextual study will help libraries design services that suit the needs, challenges, and learning habits of Generation Z in various environments.

SUGGESTION

Based on the results of the study, there are several things that library managers need to pay attention to in developing information services for Generation Z. First, libraries need to actively integrate digital technology such as LMS, social media, and visual-interactive content into daily services to suit the multitasking learning style of Generation Z. This development should be carried out through collaboration between librarians, lecturers, and information technology units on campus. Second, it is important for libraries to not only follow technological trends, but also consider the cognitive aspects and well-being of users. For example, by creating study spaces that support focus, providing bibliotherapy services, and building inclusive learning communities. Third, in implementing innovations such as makerspace or AR/VR, a training strategy needs to be prepared so that all students, including those who are not yet familiar with technology, can access services fairly. In addition, further research needs to be conducted based on empirical data and case study research involving direct participation from

Generation Z users in various types of libraries. This research can dig deeper into the variations in information needs based on different social, economic, and cultural contexts, and measure the effectiveness of technology-based services in real terms.

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