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The Influence of Environment and Digital Technology on Positive Communication and Character Formation among University Students: A Neurobehavioral Perspective

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Abstract

In the modern digital age, students' ways of communicating and developing character are deeply shaped by both their surrounding environments and their engagement with technology. This study explores how environmental conditions and digital technology together affect positive communication and character formation among university students, viewed through a neurobehavioral lens. Using a qualitative method, 35 students were purposively chosen and involved through online questionnaires and observation. The results show that supportive families, peers, and campus environments strengthen openness, empathy, and respectful communication (94–97%), while technology enhances communication efficiency (97%) but can also lead to emotional strain (55%). From a neurobehavioral perspective, both environmental and digital factors influence how students regulate emotions and make decisions. The study concludes that balanced interaction between social support and mindful technology use promotes empathy, moral awareness, and emotional stability, key components of strong character and positive communication in higher education.

Keywords: *Environment, Digital Technology, Positive Communication, Character Formation, Neurobehavioral Perspective*

INTRODUCTION

Character formation in today's society is deeply shaped by the interplay between environmental influences and technological development. Both the social environment and technology contribute to shaping human behavior and values through complex interactions between external experiences and brain activity (Wisnu Saputra et al., 2017). According to Bronfenbrenner (1979), human development occurs through complex reciprocal interactions between individuals and their social and physical environments. In the context of higher education, the family, peer, and campus environments play an important role in shaping students' character and communication patterns. These interactions allow individuals to develop certain ways of thinking and social skills that are influenced by environmental stimulation and technological exposure. Digital technology also opens access to various learning resources and interactive platforms that help nurture moral and ethical awareness (Agnia et al., 2021). When supportive social environments meet purposeful use of technology, they create a strong foundation for positive character

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growth. The development of positive communication patterns through environmental and technological factors is not a simple process. The environment functions as an ecological system, with layers ranging from family to the larger community, each influencing how people interact and communicate (Urie Bronfenbrenner, 1979). A harmonious family or an inclusive community, for example, tends to foster empathy, assertiveness, and effective communication. Meanwhile, technology has taken on a central role as an external factor that transforms how people relate to each other. It has become a kind of "new environment" that changes the way humans communicate, both verbally and nonverbally (Prensky, 2001). Through social media, instant messaging, and collaborative platforms, communication happens faster and across cultural and geographical borders. When used constructively within a positive environment, technology can help build important communication traits such as active listening, empathy, and message clarity.

The neurobehavioral perspective provides a foundation for understanding how environmental and technological factors affect the formation of human character. Perdue et al. (2021) show that reading interventions cause significant brain changes, indicating a link between learning activities and behavioural adaptation. Pambayun et al. (2023) demonstrate the process of moral value learning, which involves brain mechanisms to change behaviour through habituation and emotional reflection. Wulan and Jamaris (2023) add that specially designed play activities can stimulate children's nervous systems, strengthen emotional regulation, and shape adaptive social behaviour. It examines how social settings and media technology influence brain mechanisms and, consequently, behavior. The concept of neuroplasticity explains that continuous exposure to one's environment and technology can alter brain structure and function, leading to long-term changes in behavior and personality (Wattimena, 2021). This perspective offers a deeper understanding of how character is built and serves as a reference for designing effective educational strategies in the digital era.

Studying the effectiveness of environmental and technological influences is crucial for understanding personal growth in modern life. Indicators such as emotional regulation, moral values, and social behavior patterns can reveal how strong these influences are (Judijanto et al., 2024). Educators and policymakers need to monitor how both factors affect character formation to recognize where improvements or interventions are needed. Innovative uses of technology like educational applications and interactive platforms can enhance character education by making learning more engaging and by reinforcing positive values in dynamic settings (Afif et al., 2024). The combined influence of environment and technology on character formation, analyzed through a neurobehavioral lens, has become an important topic in human development research (Burke, 2010). However, only a few studies have explored how this perspective applies in formal education, especially at the higher education level. This research aims to bridge that gap by examining how environmental and technological media influence character formation through neurobehavioral mechanisms. Understanding this relationship is expected to provide insights into how environmental and technological factors can be integrated to encourage positive character development, while also contributing to more adaptive educational strategies in today's digital landscape.

From a theoretical perspective, the environment refers to all factors that influence a person's physical, mental, emotional, and social development. It includes family, peers, society, and culture, as well as the experiences gained from observation and interaction. According to Bronfenbrenner (1986), development occurs through multiple environmental layers, from the microsystem (family and peers) to the macrosystem (culture and social policies). As *Mind in Society* suggests, cognitive and social growth are heavily influenced by social interaction within these environments (McLeod, 2024). This happens through *scaffolding*, where individuals learn new skills with the guidance of those who are more experienced. The *Annual Review of Psychology* also supports a transactional model, emphasizing that development results from the dynamic interaction between genetic and environmental factors (Sameroff,

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2010). In education, the support of teachers and peers plays an essential role in building confidence and social ability among students.

Technology, on the other hand, refers to the digital tools, media, and platforms people use to communicate, learn, and interact. Devices such as computers, smartphones, and the internet grant wide access to information and knowledge. The acceptance of technology depends largely on how useful and easy it is to use (Davis, 1989). When used wisely, technology supports the development of positive values. However, overuse can disrupt emotional control and social interaction. Therefore, self-regulation in technology use is key to ensuring that it strengthens rather than weakens mental and emotional development.

Character formation among students involves the internalization of values, norms, and habits that shape moral, emotional, and social aspects of personality. Effective communication plays a central role in this process, reflected through empathy, integrity, and ethical behavior (Eka, 2023). Developing character is a holistic effort that engages the cognitive, affective, and psychomotor domains to create individuals who are responsible, empathetic, and ethical. Positive behavior is strengthened through literacy, meaningful experiences, and consistent reinforcement of good habits (Hartati, 2024). Thus, social interaction is vital, as individuals internalize moral values and social norms through their daily environment, whether in family, education, or culture

Positive communication refers to the ability to convey clear and constructive messages that build healthy interpersonal relationships. It involves empathy, honesty, and openness. A positive environment promotes this kind of communication by encouraging mutual respect, active listening, and assertiveness. In contrast, a negative environment can lead to miscommunication, aggression, or misunderstandings. Communication skills grow alongside moral reasoning from rule-based obedience to principled ethical awareness (Kohlberg, 1981). Positive communication strengthens relationships in families, workplaces, and communities, requiring not only verbal fluency but also attentive listening.

The neurobehavioral perspective highlights how the brain, nervous system, and behavior are interconnected, showing that experiences and environments can shape neural structures. Neuroplasticity, the brain's ability to adapt and reorganize, lies at the heart of this concept. Neuroplasticity is the brain's ability to change and adapt throughout life. These changes occur in the connections between neurons (synapses) and even in the structure of brain tissue, in response to learning, new experiences, repeated practice, injury, or changes in the environment (Lee et al, 2024). Repeated negative experiences can change brain functions and reinforce maladaptive behavior patterns, leading to mental health challenges. However, interventions such as cognitive therapy or environmental modification can reverse these effects. Positive practices like meditation or mindfulness can enhance neuroplasticity and strengthen neural pathways related to emotional regulation and focus (Jarow, 2024). Furthermore, studies connecting neurobehavioral perspectives with creative communication suggest that this perspective helps improve human literacy and character development through creative activities (Hartati, 2024). Using qualitative methods, such as observation, interviews, and documentation, these studies show that neurobehavioral strategies can help students develop stronger communication skills and positive character traits.

METHOD

This research utilized a qualitative textual analysis perspective aimed at exploring how environmental and digital factors shape students' positive communication and character development from a neurobehavioral perspective. The study involved thirty-five university students who were

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purposively chosen for their active participation in academic and digital environments. Data were mainly collected through an online questionnaire distributed via Google Forms, complemented by observation and a review of relevant literature. The questionnaire consisted of items related to several core aspects, including the influence of family, education, and community as environmental factors (1), the intensity and purpose of digital technology use such as smartphones, social media, and learning platforms (2), and indicators of neurobehavioral changes such as cognitive adaptation, emotional control, and social behavior (3). All responses were examined using thematic qualitative analysis to identify recurring patterns and interpret the interaction between environmental support and technological exposure in students' daily communication and character formation.

FINDINGS & DISCUSSIONS

3.1 SOCIAL SUPPORT FOR COMMUNICATION PATTERNS (ENVIRONMENT INFLUENCE*)*

The social environment, including peer support, family interactions, and academic atmosphere, plays an important role in shaping students' communication behaviour. The majority of respondents reported feeling encouraged to express their ideas and emotions openly because of a supportive environment. This indicates that emotional security and social reinforcement increase openness and trust in interpersonal communication. From a neurobehavioural perspective, this is consistent with the activation of the limbic system, which regulates emotional bonding and social behaviour.

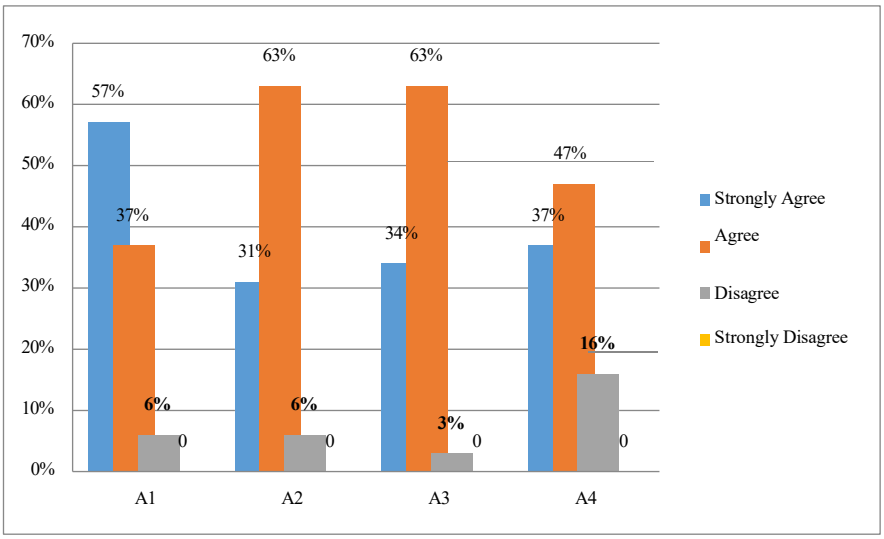

Figure 1. Diagram of the Results of the Communication Patterns (Environment Influence)

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Table 1. Description of the Results of the Communication Patterns (Environment Influence) Diagram

Code	Description	Criteria (%)			
		SA	**A**	**D**	**SD**
A1	Keluarga saya mendukung saya untuk berkomunikasi dengan baik	57	37	6	-
A2	Lingkungan kampus saya mendorong mahasiswa untuk saling menghargai dalam diskusi	31	63	6	-
A3	Teman sebaya saya berperan penting dalam membentuk pola komunikasi saya	34	63	3	-
A4	Saya merasa nilai moral yang saya pegang dipengaruhi oleh lingkungan sosial sekitar	37	47	16	-

SA= Strongly Agree, A=Agree, PA= Partly Agree, D=Disagree, SD=Strongly Disagree

The study found that the presence of social support plays a major role in shaping how students communicate. About 94% students agreed or strongly agreed that their families help them develop better ways of expressing themselves. The same percentage also mentioned that their campus promotes respectful and open discussion among students. Furthermore, 97% of respondents recognized that peers significantly influence their communication style. Overall, these findings show that communication habits are largely molded by the social environment. Family, peers, and the university community together create a setting that encourages students to build and maintain good, respectful interactions.

3.2 THE ROLE OF DIGITAL TECHNOLOGY IN COMMUNICATION

Most respondents agreed that digital tools helped them communicate more effectively and efficiently. This implies that technology not only facilitates communication but also reshapes linguistic patterns and behaviour through rapid feedback and multimodal engagement. From a neurocognitive perspective, this kind of adaptation reflects the brain's plasticity in managing attention, empathy, and decision-making in a digital context.

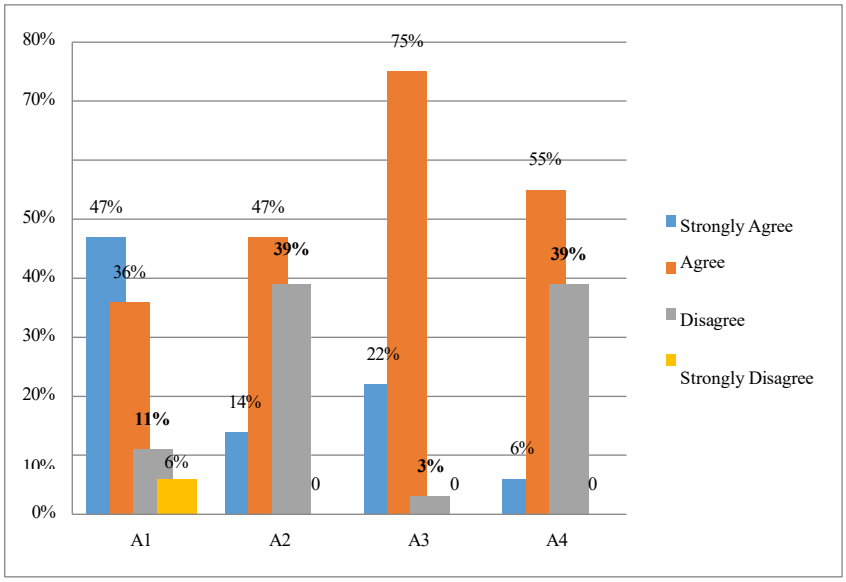

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Figure 2. Diagram of the Role of Digital Technology in Communication

Table 2. Description of the Results of the Role of Digital Technology in Communication Diagram

Code	Description	Criteria (%)			
		SA	**A**	**D**	**SD**
A1	Saya sering menggunakan media sosial (Instagram, TikTok, dll.) untuk berinteraksi dengan orang lain	47	36	11	6
A2	Saya berkomunikasi lebih banyak melalui platform digital dibandingkan tatap muka	14	47	39	-
A3	Teknologi digital membantu saya meningkatkan keterampilan komunikasi	22	75	3	-
A4	Penggunaan teknologi digital terkadang membuat saya kesulitan mengendalikan emosi	6	55	39	-

SA= Strongly Agree, A=Agree, PA= Partly Agree, D=Disagree, SD=Strongly Disagree

Digital platforms have become an inseparable part of students' communication behavior. A large of participants, around 83%, reported that they often use social media such as WhatsApp, Instagram and TikTok to interact with others. When asked about communication preferences, 61% said they tend to communicate more through digital platforms, while 39% still prefer face-to-face interaction. In addition, 97% of respondents agreed that digital technology helps them communicate more effectively, although 55% admitted that it sometimes makes emotional control more difficult. This suggests that technology provides both opportunities and challenges, it broadens access to communication but may also bring emotional tension if not used carefully.

3.3 POSITIVE COMMUNICATION SKILL

Students demonstrate a very high level of positive communication skills, as evidenced by high scores (72%–100%) in active listening, respectful discussion, and understanding emotions. They are empathetic, attentive, and emotionally aware communicators. Neurologically, this ability is closely related to mirror neuron activity and emotional regulation processes in the brain, indicating that empathy is a neurobiologically rooted ability practised in everyday interactions.

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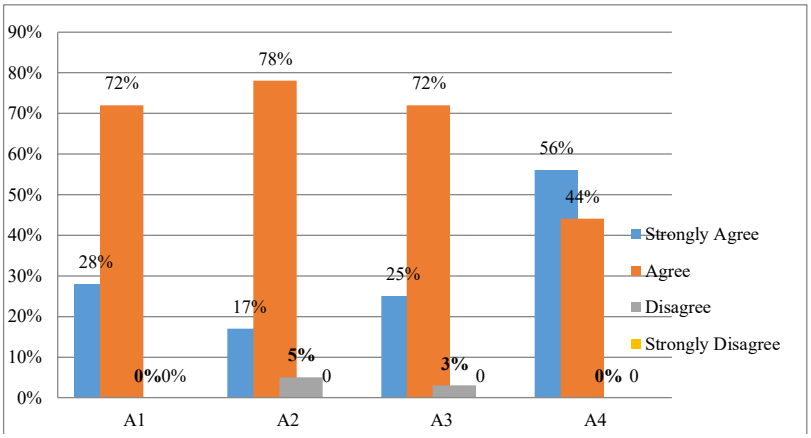

Figure 3. Diagram of the Positive Communication Skill

Table 3. Description of the Results of the Positive Communication Skill Diagram

Code	Description	Criteria (%)			
		SA	**A**	**D**	**SD**
A1	Saya terbiasa mendengarkan dengan penuh perhatian saat orang lain berbicara	28	72	-	-
A2	Saya mampu menyampaikan pendapat saya dengan jelas dan Sopan	17	78	5	-
A3	Saya merasa nyaman menyampaikan ketidaksetujuan tanpa menyinggung orang lain	25	72	3	-
A4	Saya berusaha untuk memahami perasaan orang lain ketika Berkomunikasi	56	44	-	-

SA= Strongly Agree, A=Agree, PA= Partly Agree, D=Disagree, SD=Strongly Disagree

The third set of data demonstrates that students generally possess strong positive communication skills. 100% students stated that they usually listen attentively when others are speaking. Another 95% claimed they can express their opinions clearly and politely, while 97% felt confident sharing disagreement without offending others. Interestingly, 100% students mentioned that they make an effort to understand how others feel during a conversation. Taken together, these numbers indicate that empathy, respect, and clarity are already internalized in students' daily communication patterns, both in academic and personal settings.

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3.4 NEUROBEHAVIORAL FORMATION

Findings indicate that student character development is closely related to self-awareness, emotional control, and moral decision-making, all of which are influenced by the environment and digital stimuli. Students who are adaptive in communication also demonstrate stronger moral awareness and social responsibility. This implies that character development is a neurobehavioural process, involving areas of the brain that regulate executive control (prefrontal cortex) and emotional integration (amygdala).

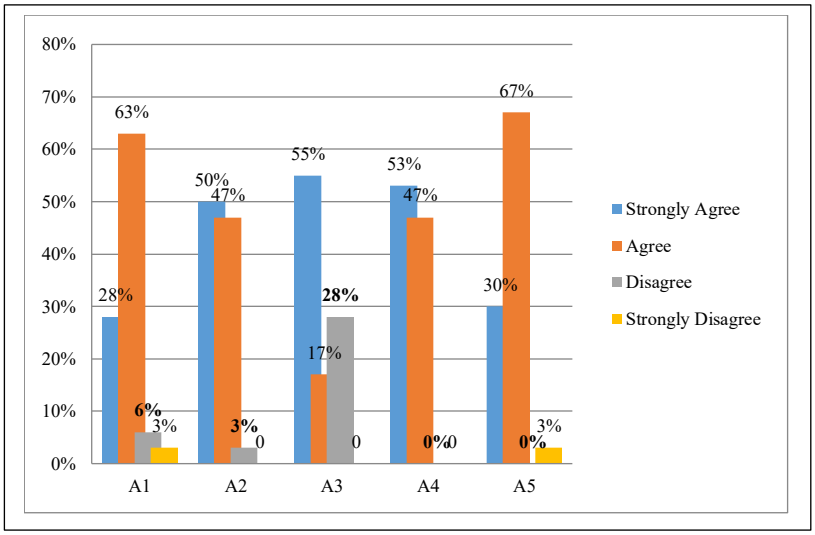

Figure 4. Diagram of the Neurobehavioral Formation

Table 4. Description of the Results of the Neurobehavioral Formation Diagram

Code	Description	Criteria (%)			
		SA	**A**	**D**	**SD**
A1	Teknologi digital memengaruhi cara saya berpikir dan mengambil keputusan	28	63	6	3
A2	Saya merasa lebih mudah mengatur emosi ketika berada di lingkungan yang suportif	50	47	3	-
A3	Saya menyadari bahwa pengalaman digital (media sosial, aplikasi) dapat mengubah perilaku saya sehari-hari	55	17	28	-
A4	Lingkungan yang positif membuat saya lebih empatik dalam Berkomunikasi	53	47	-	-
A5	Saya mampu mengendalikan perilaku negatif setelah memahami dampak teknologi terhadap diri saya	30	67	-	3

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The results also highlight that digital technology and environmental support affect how students think, act, and regulate their emotions. About 91% of students agreed that digital exposure influences their thinking and decision-making process. Meanwhile, 97% said they find it easier to manage emotions when surrounded by a supportive environment. About 72% students acknowledged that their online experiences, such as time spent on social media or apps affect their everyday behavior. As many as 100% agreed that a positive environment makes them more empathetic, and 97% said they can better control negative actions once they understand the effects of technology on themselves. These outcomes indicate that students have developed a reflective awareness of how their digital and social surroundings shape their emotional balance and behavioral responses.

The findings of this study indicate a strong interconnection between environmental factors, digital technology usage, positive communication, and the shaping of character through a neurobehavioral perspective. These results point out that a supportive social environment, together with mindful engagement in technology, plays a central role in developing students' patterns of interaction. The data show that encouragement from family, a respectful academic atmosphere, and positive peer relationships contribute significantly to the way students communicate. Many participants mentioned that their families motivate them to express themselves properly, their campus promotes mutual respect in conversations, and their peers influence how they build interpersonal communication. In this sense, the social environment becomes a key foundation for the development of positive communication habits.

Beyond the social context, digital technology also exerts a notable influence on how students communicate and manage emotions. Most students stated that social media helps them to stay connected and enhances their communication abilities. However, several also admitted that excessive technology use sometimes causes emotional instability or stress. This effect reflects the ambivalence of digital interaction, it opens broader opportunities for social engagement across distance and time, yet, when used excessively, it can create pressure and emotional fatigue. Viewed from a neurobehavioral perspective, this phenomenon can be explained by changes in brain activity triggered by prolonged digital exposure, particularly in areas related to emotional regulation and decision-making. Hence, reflective awareness becomes essential so that students can use technology constructively while maintaining mental and emotional balance.

The results also demonstrate that most students have already developed sound positive communication skills. They tend to listen attentively, express opinions with courtesy, and show empathy during discussions. These behaviors reveal that values such as respect, openness, and understanding are already internalized in their communication style. This finding aligns with the idea that positive communication emphasizes assertiveness and empathy without offending others. Therefore, the students' communication tendencies illustrate an encouraging integration of cognitive understanding and emotional sensitivity.

Analysis of the neurobehavioral indicators further reveals that the majority of participants are aware of how digital technology shapes their thinking, decision-making, and behavioral control. Many of them acknowledged that being surrounded by a supportive environment helps them regulate emotions more effectively, and that digital experiences have an impact on their daily behavior. Interestingly, almost all respondents mentioned that they are better able to manage negative impulses after realizing how technology affects their mindset and feelings. This awareness reflects both cognitive and emotional

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maturity, a sign that students are able to adapt neurobehaviorally to the challenges of the digital world. Through the process of neuroplasticity, the human brain continually reorganizes itself in response to external experiences, including social interaction and digital exposure.

Taken together, the results highlight that students' character formation and their ability to communicate positively emerge from the complex interaction between social environment and technology, mediated by neurobehavioral mechanisms. Nevertheless, these findings also underline the need for balance in technology use. Without mindful awareness, digital tools can gradually reduce empathy, foster dependency, or disrupt emotional regulation. Thus, character building in modern education can no longer be separated from the digital and social context that shapes students' daily lives. Applying a neurobehavioral perspective can help higher education institutions design learning strategies that foster self-awareness, empathy, and balanced communication, connecting cognitive, emotional, and social growth in an integrated way. This insight carries important implications for future educational policy and curriculum development in the era of digital transformation.

CONCLUSION

Based on the results and analysis that have been presented, this study concludes that the formation of positive communication and the development of students' character are deeply influenced by the combination of social environmental factors and the use of digital technology. These two elements are connected through neurobehavioral processes that shape how individuals think, feel, and respond to social interaction. A supportive environment which coming from family, university, or peers has proven to be a central factor in building a communication pattern that is empathetic, assertive, and respectful. The data also show that students who experience positive social support tend to communicate more openly and constructively.

In terms of technology, it plays a double role. Digital platforms function as learning tools that allow students to practice and develop their communication competence. On the other hand, when used excessively or without control, technology can affect students' emotional stability and even weaken their character formation. Many participants admitted that technology helped them express ideas and connect with others more easily, yet they were also aware of the emotional fatigue and behavioral risks that come with overexposure. These findings imply that reflective awareness and self-control have become essential aspects of digital literacy among students today.

Furthermore, the neurobehavioral perspective helps explain how exposure to social environments and digital media can influence brain activity related to emotion regulation, empathy, and decision-making. Students who grow in positive environments and understand these neurobehavioral impacts usually show better emotional regulation, healthier communication, and a more consistent character. This suggests that the process of character formation in higher education is not only the result of formal teaching, but also an adaptive process shaped by social and digital experiences that are managed consciously.

In addition, this research points to the importance of integrating neurobehavioral understanding into character education strategies at the university level. By recognizing how the brain, behavior, and technology interact, educators can foster a generation that is not only intellectually capable but also emotionally balanced and socially responsible in facing the challenges of the digital era. This effort will ensure graduates are ready to become leaders.

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