The Impact of Digital Transformation on Social Relations in Learning: A Study of the Transition to Virtual Learning Spaces

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Abstract

Digital transformation has shifted the learning process from physical to virtual spaces, influencing patterns of interaction and social relations between students and educators. This study uses a qualitative approach with a phenomenological method to understand the subjective experiences of students and educators regarding changes in social relations during virtual learning. The research subjects consisted of 15 students and 5 educators selected through purposive sampling. Data were collected through in-depth interviews, virtual observations, and digital documentation, then analyzed using Colaizzi's phenomenological stages. The results show that social relations in virtual learning spaces tend to be more functional, influenced by the intensity of digital interaction, technological access and literacy, communication ethics, social identity, and emotional aspects of students. The gap in digital access and capabilities creates new social stratifications that affect student participation and engagement. Changes in communication ethics and psychological pressures, including anxiety about appearing in front of a camera, also affect social cohesion. Group collaboration and support between students are important factors in building social closeness. Teachers have a strategic role in creating digital learning spaces that support healthy social interactions. The findings of this study provide theoretical and practical contributions to the development of learning strategies that maintain the quality of social relations in the digital era.

Keywords : Digital transformation, Social relations, Virtual learning

1. Introduction

Digital transformation has shifted learning systems from physical spaces to virtual ones through the increased use of information and communication technology. This shift in learning models has accelerated since 2020, when more than 91% of educational institutions worldwide adopted online systems, according to UNESCO. This shift has modified the structure of interactions between teachers and students, which previously took place face-to-face. Social relationships formed through physical contact, nonverbal expressions, and emotional engagement have shifted to digital forms of communication. The learning process has become dependent on digital devices, internet connectivity, and learning media platforms. This change demands psychological, social, and academic adaptations from all learning participants. This phenomenon has altered the way students participate, discuss, and form social relationships. The difference in learning environment from a traditional classroom to a virtual space impacts the comfort of interpersonal interactions. This shift raises questions about the

extent to which digital transformation affects the quality of social relationships during the learning process (Permata et al., 2024).

Digital platforms such as Google Classroom, Zoom, and Microsoft Teams create new patterns of interaction between students. Communication via screens reduces the direct contact that typically fosters social intimacy. Students become more focused on conveying academic information than on social interaction. High levels of virtual communication do not always translate to social closeness due to limitations in expression and body language. Digital interactions tend to be functional, rather than relational, potentially reducing the quality of social bonds between students. Learning experiences become more individualistic because students can listen to material without actively engaging in social conversations. Virtual-based learning models open up opportunities for cross-regional collaboration, but do not necessarily strengthen meaningful social relationships (Sahni et al., 2025). Reduced direct interaction can impact social and emotional development, especially for adolescent students. Interpersonal relationships during learning are a crucial factor that requires serious attention from educators.

The gap in access to technology has become a prominent issue during the implementation of digital-based learning. Data from the Ministry of Communication and Informatics indicates that 12,548 schools in Indonesia still experienced limited internet access as of 2023. This disparity in digital facilities leads to disparities in student participation in virtual learning spaces. Students who lack adequate devices tend to struggle to maintain regular communication with teachers and classmates. These limitations can lead to social isolation as students are unable to actively engage in virtual discussions. Individuals' ability to adapt to technology also differs due to economic, cultural, and family backgrounds. This disparity creates a new social stratification in education based on digital capabilities (Kansal et al., 2024). Social relations in learning become unequal when some students are active and others are marginalized. Unequal digital access demonstrates that the transformation of virtual learning has an impact on the structure of academic social interactions.

Students' digital literacy skills also influence the effectiveness of communication in virtual learning spaces. Students with high digital skills find it easier to build communication networks in online classes. Students with low skills often struggle to participate in virtual discussions. Differences in digital literacy levels create unequal communication confidence. Students unfamiliar with digital devices tend to be passive and withdraw from group interactions, and technical barriers such as audio and video interference often reduce communication quality (Kaputa et al., 2022; Deroncele et al., 2023). These factors have the potential to diminish the sense of community among students that naturally develops in face-to-face classes. The inability to express ideas quickly through digital media can lead to feelings of inferiority for some students. Academic and social relationships are affected by an individual's ability to manage digital communication effectively.

Digital transformation has led to changes in the values and ethics of interaction during the learning process. Interaction through screens allows students to more freely demonstrate multitasking behaviors, such as accessing social media during class. Communication discipline decreases because students can turn off cameras or microphones without the teacher's knowledge. This change in communication dynamics blurs the boundaries between private and learning spaces (Husna et al., 2024). Face-to-face expressions of courtesy, such as greetings, eye contact, or polite gestures, are reduced. This decline in communication ethics carries the potential for decreased social sensitivity among students. Communication behaviors lacking empathy can impact harmonious social relationships during virtual learning. Practical digital communication habits have the potential to diminish respect for the academic interaction process. These changes raise the need to develop new ethical regulations relevant to virtual learning spaces.

The existence of cameras as a communication medium is a psychological factor that influences students' social relationships. Some students feel pressured to appear in front of the camera due to concerns about social judgment. Students with high social anxiety tend to turn off their cameras, reducing opportunities for interaction with classmates. This condition leads to a pattern of withdrawal that impacts limited social relationships in learning (Sukmana et al., 2025). The use of the camera feature makes some students feel monitored, reducing spontaneous communication. This situation

creates emotional distance between individuals in the virtual learning space. Communication becomes more structured and less likely to express emotional authenticity. Social relationships become difficult to form naturally due to psychological barriers created by digital media. This phenomenon indicates that social relationships in virtual spaces are influenced not only by technical aspects but also by aspects of psychological comfort.

Changes in communication patterns impact social relationships between teachers and students. Teachers face the challenge of understanding students' emotional responses without physical presence. Evaluating students' character and attitudes becomes more difficult due to limited nonverbal interaction. Students experiencing mental distress or learning difficulties often go undetected due to minimal communication (Setiadarma et al., 2024). The teacher's role as a social facilitator undergoes significant changes in digital-based learning. Emotional support becomes more limited due to limited face-to-face contact. Teachers require new communication strategies to build interpersonal closeness with students. Learning models that focus too much on delivering material have the potential to reduce social bonds between teachers and students. The quality of social relationships during the virtual transition period is a crucial indicator of the success of digital learning transformation.

Social cohesion among students in virtual learning spaces is influenced by the effectiveness of academic and non-academic interactions. Group discussions, project collaborations, and informal activities are important means of building social relationships. Students who actively engage in collaboration tend to demonstrate a stronger sense of togetherness; a lack of informal interactions has the potential to reduce social solidarity among students (Seno et al., 2025). Virtual learning spaces often focus on completing assignments, neglecting the social aspects that previously developed spontaneously. Reduced social interaction can impact students' academic motivation. Students who feel socially connected demonstrate a stronger commitment to learning than those who feel isolated. Positive social relationships enhance student adaptation during digital learning. This situation suggests that digital transformation needs to consider the sustainability of social relationships for long-term learning success.

2. Method

This study uses a qualitative approach with a phenomenological method to deeply understand the subjective experiences of students and educators regarding changes in social relations during the virtual learning process due to digital transformation. The phenomenological approach was chosen because the research focuses on the meaning experienced by individuals in real life based on their perceptions, awareness, and construction of social experiences in virtual learning spaces. The researcher seeks to explore the essence of the phenomenon of digital social interaction without intervening in the learning process, but rather to uncover how social relations are formed, changed, and perceived by the research subjects.

The research subjects consisted of 15 students and 5 educators at the secondary and tertiary levels who had undergone virtual learning for at least two consecutive semesters. Informants were selected using a purposive sampling technique, with criteria based on experience and the ability to explain phenomena reflectively. Participants with diverse technological access backgrounds, digital literacy levels, and virtual communication experiences were included to obtain a rich and comprehensive perspective. The number of informants was adjusted until data saturation was reached.

Data collection techniques included in-depth interviews, virtual observations, and digital documentation. Interviews were conducted semi-structured via a video conferencing platform, providing flexibility for informants to describe their individual experiences. Virtual observations included observing online learning activities, student interactions, group collaboration, and the use of cameras and digital communication features. Digital documentation, including recordings of virtual classroom activities, chatrooms, and learning participation logs, served as supporting data to enhance the validity of the findings.

The data analysis process followed Colaizzi's phenomenological stages, which included: reading the interview transcripts in their entirety to gain a general understanding, identifying significant

statements, formulating the meaning of each statement, grouping meanings into themes, compiling a comprehensive description of the phenomenological experience, organizing the essential structure of the phenomenon, and conducting member checking with informants to ensure the accuracy of the interpretation. The analysis stages were carried out simultaneously with the data collection process to maintain the integrity of the phenomenological meaning.

Data validity was maintained through source and technique triangulation, member checking, and an audit trail. Triangulation was conducted by comparing information between informants and comparing the results of interviews, observations, and digital documentation. Member checking was conducted by requesting clarification or reconfirmation from informants regarding the researcher's interpretation of the data obtained. The audit trail was implemented through systematic recording of the entire research process, from planning to data interpretation, so that the research process could be scientifically accounted for.

This study adhered to ethical aspects of research by providing informed consent, transparently communicating the research objectives, and ensuring the confidentiality of participants' identities. Each informant was given the freedom to choose their own comfort level during the interview, including the option to turn off the camera. Digital recordings and learning documents were used solely for academic purposes and stored according to digital security standards. All research procedures were conducted in accordance with the principles of non-maleficence, confidentiality, and voluntary participation.

This phenomenological research method is expected to yield a deeper understanding of the essence of the social experiences experienced by students and educators during the transition to virtual learning. The research findings have the potential to provide theoretical contributions to the study of social relations in digital learning spaces and practical implications for the development of learning strategies that consider social interactions. This approach also provides a foundation for further research on social cohesion and the sustainability of interpersonal relationships in the era of digital transformation in education..

3. Result

1. Dynamics of Formation and Change of Social Relations in Virtual Learning Spaces

Social interactions in virtual learning spaces demonstrate fundamental changes compared to face-to-face learning. Students report that digital communication tends to focus on completing academic tasks rather than building social closeness. Teachers also acknowledge the difficulty of building emotional bonds with students due to the lack of nonverbal contact. Facial expressions, body language, and classroom atmosphere, which typically strengthen social relationships, no longer play an optimal role. Interpersonal relationships become more transactional as communication occurs through instructions, assignments, and academic responses. Previously socially active students experience a decrease in communication intensity because the digital environment reduces the spontaneity of conversation. The social relationships that are formed become more functional than relational, and the quality of social relationships declines even though the learning process continues (Nur et al., 2024; Alifia et al., 2024).

The phenomenon of changing social relations is evident in group collaboration patterns that are more oriented toward results than emotional interactions. Students prioritize time efficiency and division of labor without building personal closeness. Teachers note that the learning atmosphere appears quieter because few students show enthusiasm for verbal communication. Students find it more difficult to build intimacy because interactions occur through screens and audio features. The use of chatrooms as a means of communication cannot replace the depth of direct communication, and limited social spontaneity creates a feeling of alienation for most students in working together (Fauzan et al., 2025). Social relationships are built only within a small circle of individuals who already know each other. This change in communication structure results in uneven patterns of social interaction.

The role of cameras in virtual learning spaces also influences the dynamics of social relations between students. Some students are reluctant to turn on their cameras due to comfort, privacy, and

anxiety about appearing. Teachers have expressed that this reduces their ability to read students' emotional responses during learning. Students perceive the presence of cameras as social pressure because they feel they are being watched and judged by their classmates. Inconsistent camera policies create an imbalance in social visibility among students. Students who turn on their cameras tend to appear more active, while those who turn off their cameras appear more passive. This unequal visibility leads to a decrease in collective social cohesion (Iswaratama, 2024). This dynamic demonstrates how technological media shapes new social hierarchies in virtual classrooms.

Virtual learning spaces also impact the frequency of informal interactions between students. The time before and after class, which used to be shared social moments, is now lost because learning ends when the platform is closed. Opportunities for jokes, sharing experiences, and building spontaneous conversations are no longer naturally available. Students stated that the loss of non-academic interpersonal activities reduces the sense of togetherness as a learning community. Teachers perceive a classroom atmosphere that tends to be rigid because all activities are directed at academics. The lack of non-academic social interaction creates emotional distance between students. Virtual classes diminish the natural socialization process that typically occurs in physical learning environments, and the loss of the social dimension leads to weaker emotional engagement (Sari & Sangkakala, 2020).

Students' social experiences are also influenced by their level of confidence in digital communication. Students with strong communication skills appear to have an easier time building relationships, even when learning takes place online. Students who tend to be quieter experience greater difficulties because they have to speak up in a digital forum, which they perceive as more intimidating. Teachers reported that some students appear more isolated because they rarely participate in class conversations. Students find it difficult to express themselves spontaneously because they must wait their turn to speak based on digital audio settings. These obstacles lead some students to experience emotional barriers to social connection. The quality of social relationships is significantly influenced by the ability to adapt to digital communication. This dynamic demonstrates that technological media determines the character of new social interactions in learning.

Research shows that the success of virtual learning depends heavily on the stability of social relationships among students. Students who feel emotionally connected to their classmates tend to maintain higher levels of learning motivation. Teachers report that virtual classes with strong social connections exhibit more active discussions and more productive collaboration. Students who lack emotional connections typically exhibit decreased academic participation during online learning. Social disconnection creates a sense of alienation from the learning community, which can lead to decreased academic self-confidence. Social dynamics are a key factor in building a healthy virtual learning environment. Social interactions have been shown to have pedagogical functions in addition to interpersonal ones. Social relationships have been shown to influence the overall effectiveness of digital learning.

Research findings show that social relationships in virtual learning are not completely lost but significantly altered. Students and educators can still build emotional connections through digital communication, although the process requires new strategies. Teachers who provide spaces for two-way dialogue and group reflection activities have classes with stronger social connections. Students reported that using informal discussion platforms and small groups helps create emotional connectedness. Collaborative activities that emphasize social appreciation increase solidarity among students. Emotional support among students emerges when spaces for social communication are consciously provided. Positive social relationships can still be achieved as long as there are structured efforts to nurture interpersonal relationships. Virtual learning requires appropriate social engineering to maintain social cohesion.

2. **The Influence of Technological Capacity and Digital Literacy on the Quality of Academic Social Interactions**

Access to technological devices has been shown to be a key determinant of social engagement in virtual learning spaces. Students with appropriate devices, quality cameras, and stable networks demonstrate more intensive social participation in class. Students with limited technological capabilities often experience barriers and therefore rarely speak up in digital forums. Teachers confirm that students who frequently experience technical glitches tend to withdraw from discussions. Inequality in digital infrastructure leads to an imbalance in the distribution of social roles during learning (Hidayat & Indrawati, 2025). Students with low technological capabilities become less visible in the structure of academic interactions. Disparities in technological access create a stratification of social participation that is not present in face-to-face learning. Differences in technological capabilities have been shown to influence the quality of social relationships between students.

Digital literacy contributes significantly to the formation of academic social identities in virtual learning. Students who are proficient in using learning platform features tend to be more confident in discussions. Students with less skills often fear making technical errors and prefer to remain silent even though they understand the material. Teachers reported that digital skills shape different social roles, such as dominant students, supportive students, and passive students. Students stated that the ability to manage digital platforms makes some students appear more influential and respected in online classes. Digital literacy barriers cause communication anxiety, which results in decreased social interaction. This confidence gap impacts social relations between students during online learning. Digital literacy is a defining element of the academic social experience.

Dependence on technology makes students more vulnerable to stress during online learning. Students stated that technical glitches impacted self-esteem because they felt they were not participating when the difficulty was technical in nature (Simanungkalit & Sompie, 2025). Teachers highlighted the importance of social empathy for classmates with technological limitations to maintain equitable interactions. Students noted that negative comments related to delays or technical glitches impacted their motivation to communicate. The digital environment creates new social sensitivities related to technological performance, not just academic performance. Repeated technical glitches can push students away from group interactions because they feel burdened. Social relationships become fragile because technical errors can be perceived as indifference. Social identities are formed based on perceptions of technological performance.

Adapting to digital learning has also given rise to new social support mechanisms among students. Students with advanced technological skills often help their peers understand the learning platform system. Teachers view this phenomenon as a form of positive collaboration that strengthens a sense of community in online classes. Students feel supported when classmates provide short tutorials on how to use digital features. This action increases social respect among students because the assistance is provided voluntarily. Social bonds are formed through mutual assistance overcoming technological barriers rather than through direct interaction as in a physical classroom (Puspita et al., 2024). These activities demonstrate that emotional connections can be formed through digital activities. Technological collaboration has been shown to function as a means of building social relationships. Technological adaptation can be an opportunity to strengthen social solidarity.

The quality of social interactions is also influenced by the use of communication features available on digital platforms (Apriyanti et al., 2024). Students are more active when using breakout rooms because the small group atmosphere allows them to speak without social pressure. Teachers report that discussions in small groups generate higher engagement than in large class forums. Students feel more comfortable expressing their opinions when discussion groups consist of familiar peers. Proper management of digital features can increase the intensity of social and academic interactions. Virtual classes that do not utilize collaborative features show significantly weaker social relationships. The use of collaboration-friendly media has been shown to increase a sense of shared ownership of the learning process. The structure of digital platforms is a crucial variable in the formation of social relationships. Technology is not only a tool for knowledge transfer but also a style of social communication.

The technology gap appears to impact group dynamics in collaborative assignments. Students with less stable devices or networks are assigned minor roles in collective assignments because their

ability to contribute is unpredictable. Teachers stated that differences in network stability deprive some students of opportunities to participate in group work. Students reported feeling guilty because technological barriers make them appear incompetent. Other group members often take over entire assignments to avoid delays, creating unequal social relationships. Collaborative processes are diminished as collaboration shifts to groupings based on technological readiness. The digital divide creates unequal social relationships during virtual learning. Academic social networks are formed based on technological capabilities, not academic competencies.

All findings demonstrate that technological capacity and digital literacy are not merely technical factors but also have significant social implications in virtual learning. Social interactions are strengthened when students have equal opportunities, facilities, and skills to communicate. Virtual learning requires attention not only to material content but also to balanced access to technology that supports social interaction. Technical support has been shown to improve the stability of social relationships because all students have the opportunity to be heard and to be heard. Digital literacy training for students and teachers can strengthen social participation in online learning. Designing digital learning that addresses technological gaps creates a more inclusive academic environment. Equality of access and digital competence are essential prerequisites for the formation of healthy social relationships in online learning. Technology should be positioned as a social network enhancer, not a source of social inequality.

3. **Changes in Communication Ethics, Social Identity, and the Role of Emotions in Virtual Learning Interactions**

Communication values and ethics underwent significant changes during virtual learning. Students reported a decline in attention to communication etiquette due to the absence of direct contact with teachers and classmates. Teachers observed that students frequently turned off their cameras without permission, arrived late to virtual rooms, or failed to respond verbally to questions. These communication patterns formed a new culture considered normal in the digital space, despite being inconsistent with the ethics of face-to-face learning. A lack of awareness of digital ethics led to a decline in the quality of relationships between students. The virtual classroom became a space that blurred the boundaries between formal and informal behavior. Unclear communication standards impacted the harmony of social relations. Digital ethics need to be understood as the foundation of social relations in virtual learning spaces.

The phenomenon of multitasking is another social factor that impacts relationships during online learning. Students often access social media or other applications during class, reducing their attention to class discussions. Teachers report that multitasking leads to low social participation because students are not fully focused on academic conversations. The use of multiple technologies creates an attention gap between learning and social interactions. Students who multitask appear socially passive despite being physically present in the virtual space. This behavior makes it difficult for teachers to evaluate students' emotional engagement. Multitasking reduces social sensitivity because students are unable to fully read the dynamics of group interactions (Kalmar et al., 2022). Multitasking reduces the intensity of social connectedness among students.

Social identity also undergoes transformation during virtual learning. Visual appearance, camera background, and communication style in digital spaces become factors in shaping new social identities. Students stated that they felt judged based on the appearance of their personal space behind the camera, so they chose to turn off the camera as a strategy to avoid social judgment. Teachers noted that students with camera backgrounds perceived as neat or attractive received greater social attention. Students who did not display a visual identity became less recognized within the social structure of the digital classroom. Technology-based social identity formation creates new social pressures not found in face-to-face learning. Social relations become layered because virtual identities do not always reflect real personal identities, creating new social hierarchies in the virtual classroom (Zvereva, 2023).

The role of emotions also shifts during virtual learning. Students reported experiencing mental fatigue more quickly, despite fewer learning activities compared to physical classes. Teachers noted that emotional fatigue often manifests through decreased participation, rather than facial expressions,

as cameras are often turned off. Students mentioned feelings of isolation stemming from a lack of emotional contact with classmates. The inability to express emotional support leads to students feeling uncared for in study groups. This feeling of isolation leads to decreased motivation to learn and confidence in participating in discussions. Emotional states significantly contribute to the stability of social relationships in digital spaces. Emotions are no longer shared collectively but are instead internalized individually.

The pressure of appearing in front of a camera affects emotional participation patterns in virtual learning. Students with high social anxiety reported that speaking in online forums felt more stressful than in face-to-face classes. Teachers observed that shy students spoke less during online learning. Students mentioned fearing making mistakes because their voices and expressions were recorded by digital platforms. This situation created excessive pressure from social evaluation for students. Camera anxiety inhibited the expression of both positive and negative emotions in virtual classes. This barrier reduced students' opportunities to build emotional closeness with classmates. Psychological discomfort directly impacted the strength of social relationships during online learning.

Not all emotional impacts are negative, as virtual learning spaces also open up opportunities for new interpersonal relationships. Students report that digital communication makes it easier to contact classmates personally through private messages when they need academic support. Teachers report that previously distant students become closer because digital collaboration allows one-on-one communication without social pressure. Project-based learning activities can strengthen social relationships when group members provide emotional support. Students report that emotional support in group chats fosters a sense of community even when they are not meeting in person. Digital media creates new spaces for emotional intimacy through text-based communication. Social bonds can still be formed through supportive digital interactions. Social relationships in virtual learning are adaptive and influenced by creative communication.

The research findings confirm that changes in communication ethics, social identity, and the role of emotions have a significant impact on the stability of social relations in virtual learning. Adapting digital ethics is key to creating healthy interpersonal relationships in online learning spaces. Virtual social identity needs to be understood as a new social construct that can influence student self-confidence and participation. Emotional management is a crucial skill that helps students maintain motivation and social connectedness during digital learning. Teachers have a strategic role in building digital learning spaces that value ethics, identity, and emotional expression. Efforts to strengthen social relations need to be designed as part of the learning strategy, not simply as an add-on. Digital learning can be high-quality if all social elements are accommodated in a planned manner. The stability of social relations is a determining factor for the long-term success of virtual learning.

4. Conclusion

Digital transformation has changed the dynamics of social relations in learning, shifting interactions from face-to-face to virtual learning spaces. Social relations have become more functional because communication tends to focus on completing academic tasks rather than emotional interactions. The use of digital platforms, cameras, and communication features influences the intensity and quality of interactions between students. Disparities in technology access and differences in digital literacy create new social stratifications that impact social participation and engagement. Technological adaptability determines students' success in building social relationships and confidence in online communication. Multitasking patterns and changes in communication ethics influence norms of social interaction and emotional closeness. Virtual social identities are formed based on digital appearances and the ability to interact through technological media. Psychological stress, such as anxiety about appearing in front of a camera, impacts social participation and emotional connectedness. Group collaboration and support among students are important means of strengthening social cohesion despite limited physical interaction. Teachers play a strategic role in establishing learning spaces that value students' ethics, identity, and emotional expression. Positive social relations have been shown to increase motivation, participation, and the overall effectiveness of virtual learning. Successful digital learning requires

balanced attention to technology, digital literacy, communication ethics, and strengthening social bonds among students.

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