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Description System Communication Digital Learning in Schools Intermediate

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Abstract:

The rapid adoption of digital learning in Madrasah Tsanawiyah (MTs) demands a deep understanding of the effectiveness of the communication systems used. This Research is important because effective communication is the key to successful knowledge transfer in a digital environment, and often this process is hindered by noise and misinterpretation of messages. By analyzing the communication system through the lens of the Shannon-Weaver model, which focuses on the source, message, channel, and noise, we can specifically identify gaps and breakdowns in the exchange of information between teachers and students on digital platforms. This study aims to comprehensively describe the digital learning communication system in Mts, particularly in the context of the teacher's role as the source or transmitter and the students as the receivers or decoders of messages. The specific objective is to identify key elements of the channel system, encoding, decoding, and primary sources of noise, such as technical issues and information overload. This study uses a descriptive qualitative approach with a case study at one of the MtsN in Ponorogo. Data collection was carried out through in-depth interviews with teachers. The results show that the effectiveness of educational communication in digital learning at MTsN Ponorogo is highly determined by the quality of message encoding, as reflected in the choice of language and appropriate teaching methods. Field findings confirm that technical and semantic noise factors are the most significant variables hindering the knowledge transfer process.

Keywords: Digital Learning Communication, Shannon-Weaver Model Communication System

Abstrak:

Pesatnya adopsi pembelajaran digital di Madrasah Tsanawiyah (MTs) menuntut pemahaman mendalam tentang efektivitas sistem komunikasi yang digunakan. Penelitian ini menjadi penting karena komunikasi yang efektif adalah kunci keberhasilan transfer pengetahuan dalam lingkungan digital, dan seingkali proses ini terhambat oleh kebisingan (noise) dan kegagalan interpretasi pesan. Dengan menganalisis sistem komunikasi melalui lensa model ini Shannon-Weaver yang berfokus pada sumber, pesan, saluran, dan noise, kita dapat mengidentifikasi secara spesifik gap dan breakdown dalam pertukaran informasi antara guru dan siswa di platform digital. Penelitian ini bertujuan untuk mendeskripsikan secara komprehensif sistem komunikasi pembelajaran digital di Mts, khususnya dalam konteks peran guru sebagai sumber atau pemancar dan siswa sebagai penerima atau dekoder pesan. Tujuan spesifiknya adalah mengidentifikasi elemen kunci dari sistem saluran, ençoding, decoding, sumber-sumber utama kebisingan misalnya, masalah teknis dan overload informasi. Penelitian ini menggunakan pendekatan kualitatif deskriptif dengan studi kasus di salah satu MTsN

Ponorogo Pengumpulan data dilakukan melalui wawancara mendalam dengan guru. Hasil penelitian menunjukkan bahwa efektivitas komunikasi pendidikan dalam pembelajaran digital di MTsN Ponorogo sangat ditentukan oleh kualitas pengkodean pesan (encoding) melalui pemilihan bahasa dan metode pengajaran yang tepat. Temuan di lapangan mengonfirmasi bahwa faktor gangguan (noise) teknis dan semantik menjadi variabel paling signifikan yang menghambat proses transfer pengetahuan.

Kata Kunci: Komunikasi Pembelajaran Digital, Shannon-Weaver, Sekolah Menengah, Kebisingan Komunikasi, Bidang Pengalaman.

1. INTRODUCTION

In the current digital era, the adoption of technology in the learning process has accelerated significantly. Especially at the Junior High School level, digital learning is increasingly becoming an inseparable part of the education system because it provides flexibility, accessibility, and greater potential for interactivity compared to conventional learning. However, the effectiveness of digital learning is not only determined by the availability of devices and networks, but also by how well good system communication between teachers and students can continue.

Effective communication in context-based digital learning becomes essential. Only with clear, precise, and minimally obstructive communication can the transfer of knowledge from teacher to student run optimally. There are relevant classics for analyzing the communication process in digital learning, namely the Claude E. Shannon-Weaver model. According to the Shannon-Weaver model, the communication process consists of the elements sender (*source*), message, channel, receiver, *and* noise, which can disrupt the transmission of the message.

In the context of digital learning at MtsN, the teacher acts as the sender (*encoder*), delivering material via digital platforms. In contrast, the student acts as the receiver (*decoder*), interpreting the material. However, in fact, communication often encounters obstacles. Good technical issues, such as an unstable or inaccessible internet connection, are limited to devices and semantics, such as differences in field experience between teachers and students, or less common terms that students do not understand. Obstacles. This can cause *a breakdown* in communication, namely that messages are not entirely accepted or translated well by students.

Although digital technology is used intensively in schools, obstacles such as limited devices, teacher competencies, and student readiness remain significant factors. With the background behind said, Research This takes a focus on the system of communication in digital learning in junior high school, using the theoretical Shannon-Weaver model. This allows for more comprehensive analysis of the elements of communication (sender, message, channel, receiver) and the factors that

affect the effectiveness of knowledge transfer. The goal is describe how the communication system works, where the points of the constraints, as well as the *gap* between *encoding* (teacher -prepared material) and *decoding* (understanding by the student)

This study aims to conduct a deep analysis of the system of digital communication in learning at MTsN Ponorogo, with a focus on the correlation between the Shannon-Weaver communication model and digital learning. This study aims to identify key elements of communication, nuisance noise factors, and the effectiveness of knowledge transfer between teachers and students. Findings from the study. This provides policymakers with a practical framework for designing more effective, responsive policies to meet the educational needs of participants in the current technological era.

2. METHODS

Shannon Weaver Theory Concept

The Shannon-Weaver theory, often referred to as the Shannon-Weaver communication model, is one of the most influential and fundamental communication theories in the history of communication science. This theory was first introduced by Claude Shannon, an engineer at Bell Laboratories, in 1948, and then further developed by Warren Weaver in 1949. This model was initially designed to explain signal transmission in telecommunications systems, but over time, it has also been adapted to understand human communication more broadly (Leydesdorff, 2021, p. 23).

The Shannon-Weaver model views communication as a linear process consisting of several main elements: *information source* (sender), *transmitter* (encoder), *channel*, *receiver*, and *noise*. *The information source produces a message, which the transmitter* then encodes into a signal, sends it through a channel, and the receiver receives and decodes it. In this process, there is potential for interference or *noise* to distort the message.

One of the key contributions of this theory is the introduction of the concept of *noise*. *Noise* is anything that can interfere with or distort a message during transmission, whether in the form of technical, semantic, or psychological interference. This concept is crucial because it highlights that communication is not always smooth and can be influenced by various external and internal factors.

Shannon placed greater emphasis on the technical and mathematical aspects of communication, such as channel capacity and minimizing message distortion (Wheeler et al., 2023, p. 1). Meanwhile, Weaver expanded the scope of this theory to the realm of human communication, adding philosophical and semantic dimensions,

and distinguishing three levels of communication problems: technical (how accurately a message can be sent), semantic (whether the message can be understood), and effectiveness (whether the message can Influence the recipient's behavior)(Gelal Soyak & Ercetin, 2024, p. 1).

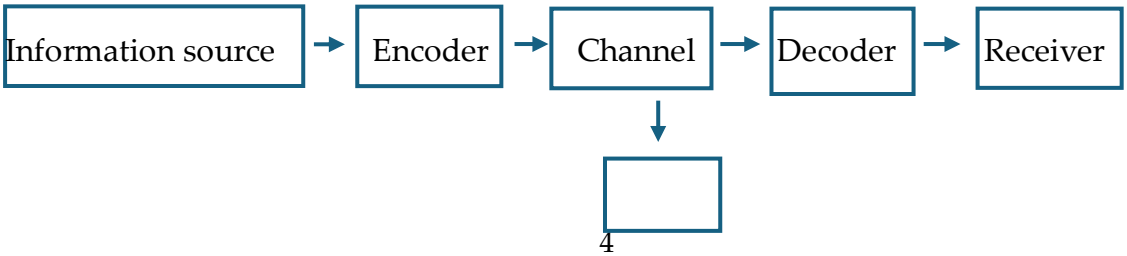
The Shannon-Weaver model has been highly influential in the development of modern communication theory across engineering, science, and the social sciences. It serves as the basis for more complex communication models and is applied across a variety of contexts, from interpersonal and mass communication to digital and virtual learning. However, it has also been criticized for being too mechanistic and neglecting the human aspects of communication, such as meaning, interpretation, and social context. Some experts consider it too simplistic to explain the complexities of human communication, which involve emotions, culture, and interpersonal relationships (Purba et al., 2025, p. 11).

Nevertheless, the Shannon-Weaver model remains relevant as a basic framework for understanding communication processes, particularly in the context of information transmission involving technology. This model also helps identify vulnerable points in communication that lead to breakdowns, thereby improving communication effectiveness, for example, in online learning or information management within organizations. Overall, Shannon-Weaver's theory provides a strong conceptual foundation for the study of communication, both from a technical and humanistic perspective. By understanding the elements and processes within this model, we can more easily analyze, design, and improve communication systems in various areas of life.

3. FINDINGS AND DISCUSSION

3.1. Implementation Elements of the Shannon-Weaver Model in Digital Learning

In the context of digital learning in junior high schools, teachers act as information sources who design learning messages. These messages are encoded through digital media such as *a Learning Management System* (LMS), the Zoom app, or other interactive *platforms.*



Noise

Shannon Weaver's communication schematic diagram

The Shannon-Weaver communication model describes the information transmission process as a linear system consisting of five main elements: information source, transmitter (*encoder*), channel, receiver (*decoder*), and destination. In this scheme, the encoder converts the message generated by the information source into a suitable signal for transmission over a specific communication channel. However, the effectiveness of this transmission is often affected by interference or obstacles, known as *noise, which can distort the message before it reaches the decoder stage and be translated back into its original form. In the digital learning process, the Shannon-* Weaver communication model is formed, namely:

1. Information source

   In the implementation of digital learning media, teachers act as a source of information (*information source*) that formulates material lessons from the brain, as the center, verbal and non-verbal messages become digital instructional messages (Didik Hariyanto, 2021, p. 96). Based on the Shannon-Weaver model, teachers are responsible for ensuring the accurate transmission of symbols for meaning and semantics, even in the presence of interference (*noise*) on the communication channel. Using room conceptual *spaces* enables teachers to optimize message delivery through compression functionality, so that technical errors do not hinder understanding and achieve objective, practical learning.

2. Transmitter

   The transmitter element in the Shannon-Weaver communication model can be identified through various technological devices that convert messages or learning materials into digital signals for dissemination to students. In the context of the learning process classes in MTsN that were studied, the elements *transmitter* are represented by the use of LCD projectors and devices, such as gadgets (smartphones) owned by students and teachers. LCD projectors play an important role in transmitting visual information in a structured, dynamic way, which is effective in attracting attention and accelerating students' understanding of the material. In addition, the facilities' laboratory computers also act as more stable transmitters of data and signals, in a way, because they are supported by more consistent

network performance. Thus, the effectiveness *of the transmitter* is often hampered by technical factors, such as the *loading* process of older devices and the high data usage of *smartphones*, which can weaken the transmission signal inside a classroom.

3. Channel

   A channel element refers to the physical or technical media used to transmit signals from the transmitter to the recipient of the message. Based on the Research results at MTsN, the main communication channels used in the digital learning process are the Wi-Fi network available in each classroom and the internet connection, which is the primary channel for distributing *e-book- based materials* and digital exam platforms. In addition to the wireless infrastructure, network cables in the computer laboratory also provide a more stable channel for high-data-rate activities such as ANBK and self-evaluation.

4. Receiver

   In the Shannon-Weaver communication model, the receiver is the ultimate destination of the message sent by the information source via the signal decoding process. In the context of digital learning at MTsN, the *receiver role* is entirely borne by the students, who are tasked with receiving and interpreting information from the digital devices used. The effectiveness of this message reception depends heavily on the quality of information transmission; the use of visual media, such as LCD projectors, has been shown to increase student enthusiasm and attention, thereby making it easier for them to understand the material being taught. However, students' capacity as *receivers* is often tested by technical disruptions, such as unstable signals that can interrupt the delivery of material and hinder their maximum understanding. Therefore, the devices' readiness and the stability of the communication channel are crucial to ensuring that the messages students decode remain accurate and aligned with the teacher's instructional objectives.

5. Noise

   The most fundamental contribution of the Shannon-Weaver communication model lies in the concept of noise sources, which identifies various factors that inhibit message transmission, ranging from semantic and effectiveness dimensions to technical barriers. These disruptions can lead to communication failures or reduced communication effectiveness. Shannon-Weaver also emphasized that every piece of information

presented (*message*) is a communication process. The information conveyed aims to increase knowledge, change attitudes, and behavior of individuals and audiences (Wiryanto, 2004, p. 15). In the context of efforts to improve achievement through *virtual learning* at MTsN, the most dominant disruption phenomenon is technical *noise*. This is reflected in the instability of the internet signal during mass device use in class, leading to interruptions in information delivery and hindering student understanding. Furthermore, technical disruptions include fundamental infrastructure issues such as unstable electricity and the risk of rolling blackouts, which directly halt all digital activities. The presence of operational time lags (*loading*) on devices at the beginning of the lesson is also a form of technical disruption that requires educators to prepare extra time to ensure adequate learning time.

3.2.Teacher Barriers and Strategies in Digital Learning Based on Shannon–Weaver Theory

Digital learning in Islamic junior high schools (MTs) is a communication process involving the teacher as the sender (*source*) and the students as the recipients (*receivers*). According to Shannon–Weaver theory, communication can be disrupted by *noise* or interference that occurs at every stage of message delivery. According to Deddy Mulyana, communication barriers in the learning process can occur when the teacher's language is too abstract, explanations are incoherent, or the delivery method is inappropriate for the students' abilities.

This lack of clarity in the message leads students to misunderstand the material or fail to receive the information fully. Sardiman AM reinforces this, who emphasized that a lack of attention, motivation, and psychological barriers, such as learning anxiety, make it difficult for students to grasp the teacher's message. In the context of the Shannon–Weaver model, these barriers are called *semantic* and *psychological noise*, namely, interference arising from differences in perception, language comprehension, and students' emotional states (Fatimah et al., 2022, p. 4931).

Environmental factors and learning media also play a significant role in the educational process, as does noise. Abu Ahmadi and Widodo Supriyono explain that hot, noisy, or poorly equipped classrooms can create physical barriers that prevent students from focusing on messages. Technical disruptions such as broken LCDs, malfunctioning speakers, or slow internet connections are also

forms of *mechanical noise* in the Shannon–Weaver theory. Furthermore, a less-than-positive teacher-student relationship, a lack of self-confidence, and academic frustration can create psychological barriers, as explained by Syaiful Bahri Djamarah. If interpersonal relationships are poor, the teacher's message may be rejected or poorly processed by students, even when delivered clearly.

In real-life situations in junior high school classrooms, these barriers are clearly visible. For example, when a teacher explains photosynthesis using scientific terms such as *chlorophyll*, *stomata*, and *dark reactions*, many students become confused and simply copy notes without understanding their meanings. This constitutes *semantic noise* because the teacher's language is not appropriate for the students' level of understanding. At the same time, a noisy classroom atmosphere from some students makes the message even more difficult to absorb, creating *physical noise*. Another example occurs when a teacher uses learning videos, but a slow internet connection makes the video choppy. Students lose focus, the message is not fully conveyed, and the communication process is disrupted. Finally, in a math lesson, a student who is already afraid and feels "not smart" will have difficulty processing the teacher's message—this is *psychological noise* in the Shannon–Weaver theory.

Thus, barriers to learning can be more clearly understood through the Shannon–Weaver framework, which emphasizes the importance of message clarity, environmental conditions, media fluency, and student psychological readiness. If *noise* at any stage is not addressed, the learning message will not be optimally conveyed to students. Therefore, teachers need to pay attention to the language they use, create a conducive classroom environment, select appropriate learning media, and establish positive emotional connections to facilitate effective communication in learning.

Teachers' strategies for optimizing digital communication based on the Shannon model focus on the efficiency of message delivery through the elements of source, transmitter, channel, and receiver. In this context, teachers act as message sources who must compose learning content precisely, concisely, and on target. The implementation of technology, such as online learning platforms and multimedia devices, serves as a transmission channel, where successful communication depends heavily on the synchronization between the encoding process *by* teachers and the decoding *process by* students. This optimization aims to minimize technical and cognitive noise *to* ensure information is conveyed accurately to the message destination.

In teacher strategy, this means that when anger arises, an educator must ensure that the message conveyed through digital media, WhatsApp, LMS, or educational platforms is clear, organized,t and understandable so that students can accept it well. Choose an appropriate channel for communication and use a suitable digital platform that supports student and materials learning, such as Google Classroom, learning groups, or group chat, for interaction, easy communication, and accessibility. Educator disturbance (*noise*) needs to anticipate the existence of disturbances in digital communications, such as problems with the internet network, device constraints for students, or miscommunication messages.

Strategies that can be implemented include giving delivery repeat material, utilizing supporting media, and ensuring the message is understood (Sholikhah & Ristianah, 2022a, p. 20). Educators must give feedback because it is essential: it provides students with means and responses, fosters two-way communication, strengthens understanding, and builds emotional and motivational Connections (Sholikhah & Ristianah, 2022b, pp. 71–72). Educators need to improve their digital skills and digital empathy. They need to repair their digital literacy and skills in online interpersonal communication, including developing a sense of digital empathy to condition students to communicate more effectively and build relationships between teachers and students, intertwined with Good.

This strategy is supported by the use of appropriate digital technology, by teacher education to increase digital skills, and by the availability of supporting infrastructure. Thus, Shannon's model helps teachers understand the importance of every element of communication to avoid errors in delivering messages in the context of digital learning and to increase interaction between teachers and students online.

3.3.Research Result

From the results of of our observations through an an interview with a teacher at one of the Madrasah Tsanawiyah Regency Ponorogo, we, we obtained information about the obstaclesan *(noise*) in the digital learning process,, at the same time, efforts were made to handle them by, both teachers and the school made efforts to handle it.

Types of Noise	Source Disturbance	Impact on Communication	Description Problem	Solutions or Anticipatory Steps
Physical Noise (Physical/Technical Interference)	Infrastructure & Geography	Disconnection of message transmission from the teacher to the student	Internet signal instability during mass device usage and rolling power outages	Installation of signal boosters in each class and provision of generators as backup power
Technical Noise (Device Interference)	Hardware	Hinders the smooth duration of learning	*loading* process and inadequate student device specifications	The teacher conducts an early device check and transfers students to the computer lab.
Channel Noise (Channel Limitation)	Facility Management	Messages cannot be delivered simultaneously	Computer laboratory capacity is limited (only 60 students)	Strict and rotating schedule for laboratory use
Semantic Noise (Comprehension Disorder)	Human Resources & Cognitive Readiness	A decrease in the level of understanding of the material by students	The teachers' heavy workload (24 hours/week) risks reducing the quality of digital material preparation.	Regular evaluation at the end of the learning session to identify obstacles to student understanding

This school has integrated technological elements such as e-*books*, computer lab facilities, and the use of gadgets (smartphones) and LCD projectors to support teaching and learning activities in the classroom. This step was taken to adapt teaching methods to current developments and the needs of students in the information age. Although digitalization has been implemented, its application in the field is not without significant technical challenges. One of the main obstacles

encountered is unstable internet connectivity, especially when the learning process involves widespread use of gadgets in the classroom.

These connectivity disruptions directly affect students' understanding of the subject matter, as information delivery is often interrupted. To minimize this impact, the school demonstrates its commitment by conducting regular evaluations at the end of each learning session. This evaluation process aims to identify specific obstacles and find the best solutions to create a more conducive, stable, and effective digital learning environment for the entire school community.

To support digital infrastructure, the school has provided Wi-Fi access in every classroom. However, heavy mobile device use often leads to unstable connections. This contrasts with computer labs, which tend to have more consistent network performance and rarely experience similar technical issues. However, these labs have limited capacity, with space for only around 60 students at a time. As a result, if learning activities are scheduled in the labs, students must rotate between classes, requiring strict scheduling to avoid conflicts.

From a student perspective, there is high enthusiasm for technology-based learning methods. Students tend to prefer interactions with digital devices, particularly LCD projectors in the classroom. This visual medium is considered far more engaging than conventional methods because it can present material in a structured and interactive manner. The use of dynamic visualizations has been shown to increase student attention and accelerate their understanding of the concepts taught by teachers. However, this convenience is sometimes hampered by technical operational challenges, such as the initial setup process and device loading, *which* can take quite a long time at the start of a lesson. This situation requires teachers to be adequately prepared, including conducting early device checks to avoid wasting valuable learning time.

In addition to daily learning, digital technology is also optimized for evaluation activities such as *tryouts* and exams. During digital *tryouts*, students are trained to work independently using school-provided devices. The system requires students to immediately report any technical issues, whether network disruptions or device damage, to the officer or committee on duty. This procedure has proven effective not only in ensuring the smooth running of exams but also as an educational tool for shaping students' character, making them honest, independent, and responsible for the tasks they complete.

Teachers' workload and time management are also crucial factors in the success of this digitalization. For teachers with State Civil Apparatus (ASN) status at this madrasah, the weekly teaching hours are 24. In a typical day, a teacher can

teach 3 to 4 subjects, with each session lasting 2 to 3 hours. With such a dense workload, time management skills are key, especially since using digital media requires additional technical preparation time before lessons begin. On the other hand, the use of computer laboratories is more focused on administrative activities and the development of specific skills, such as ICT subjects, extracurricular activities, and the implementation of the Computer-Based National Assessment (ANBK) and Madrasah Assessment, which often last until the afternoon on a rotating basis.

Its remote location further complicates the infrastructure challenges at this madrasah. Fundamental issues such as power stability and internet connectivity quality pose persistent obstacles. Rolling power outages pose a real threat, potentially halting the entire digital learning and evaluation process. To mitigate the risk of system failure during crucial exams such as the National Computer-Based Exam (ANBK), the school has installed a generator set as a backup power source. This preventive measure is crucial to ensuring exams proceed as scheduled without compromising the validity of student results. Furthermore, the school has taken the initiative to install signal boosters in each classroom to ensure equal internet access for all students.

Inclusivity and fair access are also serious concerns. Teachers recognize that not all students have devices with adequate specifications to run specific digital platforms. As a solution, students experiencing personal device issues are directed to use the computer lab, ensuring no student is left behind in the evaluation process. Prior to the exam, the technical team also conducts a thorough check of hardware, software, and network stability to minimize the risk of disruption. Overall, despite geographical and infrastructure limitations, good coordination among school staff, teachers' preparedness to address technical issues, and thorough planning enable digital learning at this MTsN to continue inclusively and effectively.

4. CONCLUSION

Based on the materials and results presented, the Research can conclude that the digital hat system supports ital learning at the school level, especially in MTsN Ponorogo, and that the information transmission process is highly dependent on synchronization among the transmitter, channel, and receiver. Within the framework of the *Shannon* -Weaver model, *the* teacher *plays* a role as the source of information that designs the instructional message, while device technology, such as LCD projectors,

laboratory computers, and gadgets, functions as the transmitter that converts the material into digital signals. Research shows that the effectiveness of knowledge transfer in this digital environment is primarily determined by the quality of teachers' coding *(encoding*) and students' decoding, so *that* meaning and semantics remain intact.

Although digitalization has been widely adopted, there is a significant challenge in the form of various disturbances or *noise* that can trigger communication failure or *breakdown*. Disturbance covers *physical noise* and *technical noise*, such as an unstable internet signal at the moment, power outages, and the *loading* process of an old device. Apart from the technical factors, there are obstacles in the form of *semantic noise* arising from different levels of understanding, language, and scientific and *psychological noise* originating from emotional conditions or anxiety in students. There are obstacles. This demands that teachers be technically ready, have extras, and have good management skills to remember and balance enough work and time.

As a step in advance, the school has to use various strategies to minimize disturbances, such as installing an amplifier signal, providing generators as a backup power source, and arranging a timetable for the use of laboratory computers on a rotating basis. In addition, routine evaluations at the end of each session, and learning and giving bait feedback, become key to ensuring the message is understood accurately by students. Overall, thorough coordination among adequate infrastructure, teachers' digital skills, and empathy for students' conditions allows digital learning to remain inclusive and effective, although geographical constraints may limit it.

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