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Improving Community Task Performance through Synchronous Communication in Plastic Waste Management for Rivers

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ABSTRACT

The findings of this study can be utilized to enhance the effectiveness of direct communication in outreach programs aimed at reducing plastic waste pollution in rivers. Practically, this research facilitates community understanding, encourages active participation, and promotes better collaboration in efforts to maintain river water quality, particularly in the West Java region. This study used multi-stage sampling to select the areas with the highest pollution levels in West Java Province, Indonesia. From pre-research and observation, two areas were selected, namely Bandung City and Bandung Regency. The area is prone to pollution and flooding due to plastic waste clogging. Respondents were selected as many as 503 heads of families who live about 10 to 100 meters from the river. This research employs the statistical analysis to examine the relationships between variables in plastic waste management programs. This approach facilitates the prediction of the impact of synchronous communication on community participation in maintaining river water quality. The results of the hypothesis test showed that there was a positive and significant relationship between the tested constructs. The synchronous communication construct affects the Communication Process, which in turn influences Communication Performance and Task Performance. The communication process that produces good sharing understanding will increase the involvement and participation of the community to be involved in the task of cleaning up plastic waste in rivers. Community participation since 2008 has had a positive significance with the improvement of river water quality in West Java, Indonesia.

Keywords: Synchronous Communication, Community, Plastic Waste, River Pollution

INTRODUCTION

The plastics industry continues to grow in European countries. News in the media shows an increasing demand for the use of plastic (Alqattaf, 2020). Developed countries in Europe have demographics with different plastic waste management systems. There was a change in the plastic waste management system from 1997 to 2006. The trend is seen in a decrease in recycling and the circular economy for energy in several European countries. Several European countries are calling for an improvement in the waste management hierarchy in order to reduce the impact on the environment. Three European countries such as Germany, France and the UK have diverse technological and institutional approaches to waste management. Several studies in the context of tackling plastic waste list the UK as the country with the lowest level of awareness. Meanwhile, Germany is a country with the highest level of awareness in tackling plastic waste (Chioatto et al., 2023; Morin-Crini et al., 2022).

Developing countries such as Ghana, India, China, Indonesia, Malaysia and the Philippines are the biggest contributors to plastic waste in Asia. Society is increasingly

dependent on plastic, which is a part of everyday life. In addition to that, the problem of mismanaged plastic waste is very acute in developing countries. Thus, new regulations must be implemented in line with trends in waste production, use and disposal in developing countries. Mismanagement of plastic waste is especially a problem due to an ineffective waste management system. The infrastructure for collection, reuse and recycling is often inadequate (Garcia et al., 2019; Mao et al., 2020; Nurysyifa & Kaswanto, 2021).

Indonesia with a population of more than 275 million is in the middle of a plastic waste emergency. The Ministry of Environment and Forestry estimates that the daily generation of plastic waste is 0.07 kg/capita. The total waste generation rate is 0.87 kg/capita/day. Around 4.9 million tons of plastic waste were reported to be mismanaged and leaking into the environment. For information, in Indonesia, West Java province to be precise, in 2018-2025 a program for handling polluted rivers called the Citarum Harum Program has been launched. One approach that is intensely carried out is direct socialization with the tagline is prohibition of littering

or protecting the river environment from trash. Direct socialization approach by visiting the house to the house. Follow-up approach by inviting program target communities to participate in coaching at village and sub-district offices. The target of the Citarum Harum Program is residential areas close to rivers. The position of the house facing the river makes the river synonymous with dirty waste. Some Indonesian people consider the river as a giant garbage dump. Sources of water pollution from plastic waste generally come from residential areas. Many activities around the river can cause pollution and affect and reduce water quality.

Java Island, Indonesia, is home to its longest river, the Citarum River, which has been designated by the World Bank as the most polluted river in the world. The condition of the Citarum River basin is severely polluted from upstream to downstream, with a range of complex issues. The pollution is primarily caused by industrial waste, domestic waste, agricultural waste, and livestock waste. This situation is alarming, considering that approximately 20 million people rely on the Citarum River for their livelihoods. The Citarum River is utilized by communities for various purposes, including agricultural irrigation, supporting industrial activities, providing drinking water for residents of Bandung, Cimahi, Cianjur, Purwakarta, Bekasi, and Karawang, as well as supplying raw water for residents of Jakarta (Marselina et al., 2022).

Domestic waste contributes 60-70 percent of the pollution in the Citarum River. With an annual population growth rate of 0.50%, the amount of household waste discharged into the river is expected to continue increasing. Many people living around the river basin have developed the habit of disposing of waste improperly, as it is considered an easy and cost-effective solution. Many people still regard rivers as a large waste disposal site. Approximately 9.14 million people in West Java continue to dispose of human waste into rivers. According to data from the WHO and USAID, there are 27 cities and regencies in West Java with poor sanitation. The Minister of Health stated that one of the causes is poverty. Additionally, the high population density in the cities and regencies of Bandung makes it difficult to construct septic tanks in areas outside homes (Sembiring et al., 2020).

Previous studies have shown that campaigns in environmental communication play a significant role in raising public awareness about the importance of environmental preservation. Communication strategies that deliver engaging and easily accessible information to diverse audiences have proven effective in influencing behavioral changes within society. However, previous research has yet to explore in-depth the process of information delivery that can enhance performance in tasks related to cleaning waste from rivers.

Previous studies have shown synchronous communication on the issue of water pollution making a significant contribution. Synchronous communication in direct socialization is an interactive and rich medium for updating information. Building perceptions and actions starts with providing knowledge, social norms and

behavior. Socialization by strengthening social norms to avoid using plastic is believed to change the intention to consume plastic bags. The intensity of the visualization of the dirty face of the city is to make people aware that changing the environment requires mutual cooperation from the community. The community participation approach in Southeast Asia can change knowledge. Community knowledge is changed with the level of interest and previous community experience. Community knowledge in proper waste segregation can mitigate a third of the waste problem. The end result of socialization depends on the socio-psychological conditions of each individual in society (Musasa et al., 2023; Zikargae et al., 2022).

The pioneering theory of synchronicity media, namely adaptive structural theory, channel expansion theory and information processing theory, has not yet explained how the communication process is conveyed and the interpretation of meaning. From this gap, this research adds a communication process (delivery or conveyance) and (interpretation or convergence) (Son et al., 2019). Both processes involve interpersonal and cognitive aspects. The success of true communication must go through the process of how each individual is involved in the process of preparing information, understanding meaning of information and integrating it into mental models. In the process of communication for the final result of meaning requires a high level of synchronicity that supports giving and receiving interactions. Convergence requires less consideration of new information resulting in situations in which individuals have shared mental models, encoding and decoding. Without conveying adequate information, individuals will reach wrong conclusions (Mahadevan, 2024). Without adequate convergence on meanings, individuals cannot move forward to other activities because they will lack a shared understanding. The final result of interpreting the information about the ban on throwing plastic waste into rivers is expected to build communication performance in the form of sharing understanding among socialization participants.

The novel contribution of this study is in the theory of media synchronicity, a new proposition was born which describes the relationship between communication approaches and synchronicity. This synchronicity is related to the job's performance requirements for performance communication. This results in better and more precise sets of constructs and relationships that increase the application of theories about communication performance and task performance. From this research background, the purpose of the research conducted was to find out how synchronous communication links work to improve the performance of the community's task of cleaning up plastic waste in the rivers.

Based on the problems stated previously, the objective of this research is to analyze the impact of direct socialization, the communication process, communication performance, and task performance on plastic waste management in selected riverside area in Bandung Region.

RESEARCH METHODS

This study employed a survey method to collect data. This approach was chosen to reach a large number of respondents through questionnaires. By utilizing the survey method, the researchers were able to obtain a representative sample and engage a substantial number of respondents, making the results more broadly applicable. Prior to data collection, the researchers first developed a theoretical understanding of the research problem. This step was crucial for comprehending the context, concepts, and theories relevant to the study's topic. Once the theoretical framework was established, data were collected to provide empirical support for the formulated theory. This demonstrates that the study

aimed to validate the theory by analyzing data obtained from the respondents. This study evaluates the Citarum Harum Program which was launched in 2008 to 2025. Questionnaires will begin to be distributed to respondents in 2021. The final results of quantitative data analysis are to measure the success of synchronous communication to improve the task performance of cleaning up river pollution from sustainable plastic waste. Open interviews were conducted with people living near rivers to explore causal relationships exploratively.

Research Model

Based on the literature review, the research model illustrated is in Figure 1.

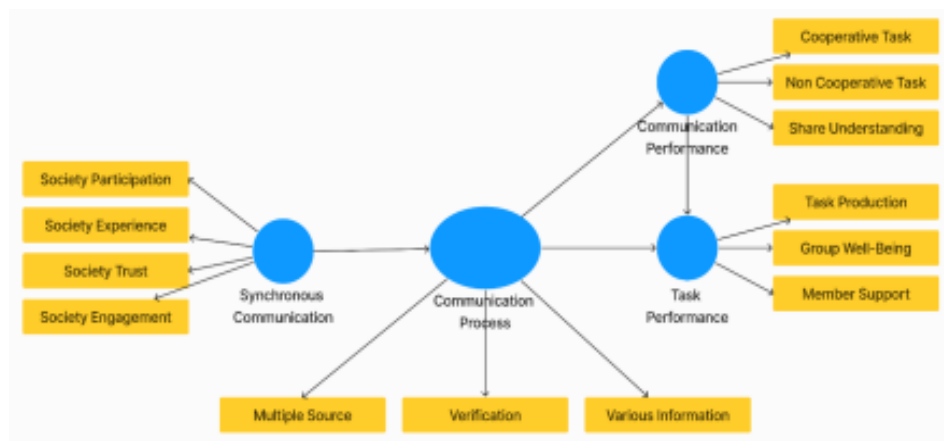


Figure 1. Synchronous Communication Research Model to improve the performance of the task of cleaning up plastic waste

The research model illustrated in the figure outlines the relationships among the key variables: Synchronous Communication, Communication Process, Communication Performance, and Task Performance, which contribute to the success of environmental programs such as *Citarum Harum*. Synchronous Communication, influenced by community participation, experience, trust, and social engagement, serves as the foundation for establishing a more effective communication process through diverse information sources and data verification. This communication process, in turn, impacts Communication Performance, encompassing tasks such as cooperative efforts, shared understanding, and non-cooperative activities. Ultimately, Task Performance is evaluated based on task productivity, group well-being, and member support in effectively managing plastic waste.

In addition to the previous explanation, the operational definitions of the variables are arranged as follows:

1. Synchronous Communication

Refers to real-time interactions in direct socialization to enhance information conveyance and understanding, measured by community participation, trust, and engagement in plastic waste management.

2. Communication Process

The process evaluates message delivery and understanding, assessed through multiple sources,

verification, and diverse information shared about plastic waste management.

3. Communication Performance

Measures collaboration effectiveness in cooperative and non-cooperative tasks, evaluated by problem-solving and consensus-building in plastic waste management.

4. Task Performance

Focuses on outcomes like productivity, group well-being, and member support, measured through task completion and decision-making efficiency in managing plastic waste.

Subsequently, questionnaires are used to identify the influential significance of each variable in plastic waste management for the river with an ordinal measurement scale of 1-5: strongly agree, disagree, unsure, agree, and strongly disagree.

Sampling Withdrawal Technique

The sampling procedure for research uses multi-stage sampling or clustering sampling. Clustering sampling is an ideal sampling procedure when it is constrained to collect a list of all the elements that make up the population. The first stage is based on a map of the pollution source areas in the Regency and City of Bandung. The two regions are areas with the highest levels of plastic waste pollution in West Java. The city of Bandung is a region in the highlands with the highest level of river pollution. Plastic waste that has accumulated causes flooding in the Bandung Regency

area. In the second phase, two villages and sub-districts were selected in Bandung City and Regency, 10 - 100 meters from the river. In the third stage, the amount of sample is determined using the Slovin formula with a significance level of $\alpha = 0.5$. From a population of 2500 households living near the river, 503 households were sampled. One of the research locations is portrayed in Figure 2.



Figure 2. The Research Location of The People Who Live Close to The River Location

Data Collection Techniques

In this study, the first stage involves observation. Pre-research was conducted by visiting sector offices and observing various activities carried out for the community. Field observation aimed to better understand the situation related to prevention and environmental conservation movements. During the observation stage, the researcher visited the Environmental Agency, the Communication and Information Agency of West Java, as well as sectors dealing with river pollution caused by domestic waste. From the 22 existing sectors, 3 sectors were selected that focus on the issue of domestic waste. Field observation aimed to gain a deeper understanding of the situation concerning efforts to prevent and the movement to clean rivers from domestic waste.

In the second phase, a demographic analysis was conducted on the population residing near the riverbank to accurately identify the population size. Using a survey method, information was gathered from respondents through the distribution of questionnaires. The survey aimed to collect structured quantitative data from 503 households, allowing for broad demographic representation and analysis of inter-variable relationships using data processing techniques with the PLS-SEM software. This combined approach provides both in-depth insights and valid statistical data to evaluate the effectiveness of synchronous communication. The combination of interviews and surveys enhances the credibility of the research findings through comprehensive data triangulation. Surveyors visited households and distributed questionnaires to each head of household,

ensuring that the data collected from the sample represented the entire population. Before administering the questionnaires, surveyors explained the purpose of data collection and assisted in reading and clarifying each question. Each head of household was presented with 38 questions, using a 1-5 ordinal scale: strongly agree, disagree, undecided, agree, and strongly disagree.

In the third phase, to collect explanatory data, research assistants conducted open interviews with task forces in sectors 22, 6, and 7, local government officials, public relations, the Communication Office of West Java Province, the NGO Institute Citarum Harum, community leaders, religious figures, and residents living near the river. This process provided a qualitative understanding of their attitudes and behaviors toward the Citarum Harum Program. Interviews are a key procedure in mixed-methods research for collecting both qualitative and quantitative data. These two types of data are integrated during the analysis process, either by merging or synthesizing them. The qualitative and quantitative data are analyzed separately, and the results are then compared to determine whether the findings corroborate or contradict each other.

Data Validity and Reliability Test

Surveyors visited households and distributed questionnaires to each head of household, ensuring that the data collected from the sample represented the entire population. Before administering the questionnaires, surveyors explained the purpose of data collection and assisted in reading and clarifying each question. Each head of household was presented with 38 questions, using a 1-5 ordinal scale: strongly agree, disagree, undecided, agree, and strongly disagree

Data Analysis Technique

This research employs the technique Partial Least Square Structural Equation Model (PLS SEM). PLS SEM is a prediction model to estimate parameters and causality relationships. Evaluation of the partial least square model is carried out by evaluating the outer model and inner model. The outer model is a measurement model to assess the validity and reliability of the model through algorithm iteration, Cronbach's alpha, composite reliability, AVE. The inner model is a structural model for predicting the causality relationship between latent variables. Through bootstrapping, T-statistic test parameters are obtained to predict the existence of a causal relationship (Sarstedt et al., 2020).

This study involves many indicators and the PLS SEM can predict the causality relationship for each variable. Some of the variables tested in this study include variable X synchronous communication in direct socialization, 'communication process with variable Y communication performance and task performance through hypothesis testing.

RESULT AND DISCUSSION

Outer Model Measurement

Convergent validity of the measurement model with reflexive indicators can be seen from the value of the loading indicator in table 1 below

Table 1.
Outer Loadings

Construct	Item	Loadings
Socialization and communication	Community participation	0.736
	Community experience	0.721
	Community trust	0.716
Communication Process	Multiple source	0.814
	Various information	0.793
	Verification	0.710
	Community engagement	0.680
Communication Performance	Cooperative task	0.733
	Non cooperative task	0.682
	Share understanding	0.743
Task Performance	Task production	0.773
	Group well being	0.790
	Member support	0.817

From the table 1, it can be seen that all reflective indicators have a loading value above 0.7, except for the "Community Engagement" indicator in the Communication Process and "Non cooperative task" in Communication Performance construct which has a loading of 0.680 and 0.682 respectively. Even though this loading value does not reach 0.7, in scale development research, usually loading values above 0.6 can still be accepted as good convergent validity or acceptable (Rustam & Tentama, 2020).

Thus, based on the outer loadings table given, it can be concluded that the Socialization and communication, Communication Process, Communication Performance, and Task Performance constructs have good convergent validity because all of their reflective indicators have loadings above or close to 0.7. However, it should be noted that improvement or further development of the "Verification" indicator in the Communication Process construct may be required to improve the overall convergent validity.

Inner Model Measurement

The Average Variance Extracted (AVE) value, which also measures convergent validity, must be above 0.50 to achieve good convergent validity. Cronbach's alpha, rho-A and composite reliability values must be above 0.70 for good reliability. The table showing these values can be seen below in table 2.

Table 2.
Reliability Test

Construct	Cronbach's alpha	rho-A	Composite reliability	AVE
Socialization and communication	0.799	0.728	0.771	0.661
Communication Process	0.753	0.769	0.775	0.640
Communication Performance	0.723	0.728	0.757	0.610
Task Performance	0.708	0.716	0.836	0.630

Convergent Validity (Average Variance Extracted, AVE): The expected AVE value must be above 0.50 to achieve good convergent validity. In this table, all constructs meet these criteria because they have an AVE value above 0.50. Reliability (Cronbach's alpha, rho-A, Composite reliability). These values indicate the degree to which the construct is reliable. Usually, a value above 0.70 is considered a good level of reliability.

Overall, although some constructs have reliability values slightly below 0.70, these values are still within the acceptable range. Therefore, based on this Reliability Test table, the constructs tested show good convergent validity and an acceptable level of reliability.

Discriminant Validity Test

The data discriminant validity test was seen from Fornell Lacker, namely from the point of view of the AVE root value it must be greater than the correlation value between construct. The table showing result of discriminant validity test can be seen below in table 3.

Table 3.
Discriminant Validity Test

Variables	Communication Performance	Communication Process	Socialization and Communication	Task Performance
Communication Performance	0.714			
Communication Process	0.365	0.735		
Socialization and Communication	0.544	0.488	0.679	
Task Performance	0.316	0.334	0.318	0.794

To test discriminant validity, we compare the correlation values between the constructs and the roots of the Average Variance Extracted (AVE) of each construct. If the AVE root value is greater than the correlation between constructs, then the discriminant validity is considered good. In this table, the AVE roots of each construct are on the main diagonal, that is, under each correlation value between constructs (Boadi et al., 2022). For example, for Communication Performance, the root AVE is 0.610, which is smaller than the correlation

between Communication Performance and Communication Process (0.714). Based on this analysis, it can be concluded that the constructs tested have good discriminant validity.

Path Coefficients

In the table 4 below, we look at the path coefficients between the tested constructs, along with other information such as the sample mean, standard deviation (STDEV), t-statistic, and p-value.

Table 4.
Path Coefficients

Construct Influence	Original Sample	Sample mean	STDEV	T Statistic	P Value
Socialization and communication -> Communication Process	0.448	0.451	0.036	12.380	0.000
Communication Process -> Communication Performance	0.365	0.374	0.043	8.554	0.000
Communication Process -> Task Performance	0.252	0.257	0.041	6.155	0.000
Communication Performance -> Task Performance	0.224	0.230	0.061	3.675	0.000

The important path coefficient to note is the original sample value of each path. These values indicate the extent to which one construct influences other constructs in the model. Socialization and communication have a path coefficient of 0.448 to the Communication Process. This value indicates a significant positive effect of Socialization and communication on the Communication Process. High t-statistic value (12.380) and a low p-value (0.000) indicates the strength and significance of this relationship.

Next, we look at other path coefficients, such as Communication Process to Communication Performance (0.365), Communication Process to Task Performance (0.252), and Communication Performance to Task Performance (0.224). All of these path coefficient values indicate a significant positive influence between these constructs.

Overall, based on this Path Coefficients table, we can conclude that there is a positive and significant relationship between the tested constructs. Socialization and communication constructs affect the Communication Process, which in turn influences Communication Performance and Task Performance.

The first hypothesis analyzes the relationship between the direct socialization approach and the communication process which has a positive relationship. Synchronous communication is known as an important factor affecting interpersonal and group communication. Synchronous communication is selected so that all participants can communicate at the same time. Synchronicity occurs among individuals when they show a pattern of coordination with the same focus. Synchronous communication through a direct socialization approach is suitable not only for conveying information on the prohibition of throwing garbage into the river but also for

the meaning of coordinating river cleaning tasks to improve river water quality (Thomas et al., 2023). When the community is involved in socialization and working together to clean the river, it requires coordinated (high synchronous) behavior with a level of joint focus between senders and receivers. Open interviews with 100 heads of households indicated that it was easy for the community to understand the information conveyed because of the interactive situation. The community immediately asked questions and verified the ban on throwing garbage, the task of cleaning the river, the condition of the river's water quality. High synchronicity provides opportunities for socialization participants to receive direct feedback on any information sent. Theorists proposed selecting high synchronicity to support the interaction of giving and receiving information. Synchronous height can also provide individuals with the ability to receive feedback (Jong et al., 2021). The program initiator as the sender of information uses a pattern of installments of information continuously and waits for feedback from the people who receive the information. Submission of information in installments on the communication process variables is included in the conveyance construct. Communities receiving home visits can send feedback on an ongoing basis. This is because the convergence communication process can provide better capabilities to verify understanding. At the convergence stage, information is processed and interpretation is given regarding technical coordination for cleaning the river. The aim is to agree on the meaning of the information on the prohibition of throwing plastic waste into rivers, the dangers of pollution and how to prevent it. The community will give approval or disagree on the procedure for cleaning the river. Several studies suggest that synchronous communication is

suitable for involving community participation in a program. Communities participating in environmental education activities provide direct and detailed feedback on environmental cleaning practices. Direct outreach involves the emotional skills of the participants in communication to discuss and share experiences. Emotional awareness is important for communication exchange and resolution of river pollution from plastic waste (Fleischmann et al., 2019).

Based on the first hypothesis, this study highlights the importance of synchronous communication, particularly in enhancing community engagement in environmental programs, such as river cleanups from domestic waste. Previous research indicates that synchronous approaches foster interpersonal involvement by facilitating direct feedback and shared focus during the socialization process. These findings align with the work of Gebremariam et al. (2024), which demonstrates that direct socialization methods not only simplify complex messages but also improve coordination required for tasks like river restoration. This synchronous interaction is consistent with the social digitization theory, which emphasizes the crucial role of direct communication in promoting collective behavior and environmental responsibility. The study also demonstrates that high levels of synchronization promote dynamic exchange, enabling participants to effectively assimilate and verify information, which in turn strengthens their understanding and motivation to act in accordance with the communicated goals (Cai et al., 2020). This insight supports the hypothesis that direct socialization methods, supported by synchronous communication, are crucial for fostering collective environmental action.

These findings have significant practical implications, suggesting that synchronous communication strategies can be integrated into environmental policy programs. Activities that have been conducted, such as home visits and group discussions, can be utilized to enhance community engagement in collective efforts to reduce plastic pollution.

In the second hypothesis the analysis of the relationship between the Communication Process approach and Communication Performance has a positive relationship. Communication has been defined as a process in which participants create and share information with each other to achieve mutual understanding. Information sharing is inherently a process of exchange, where developing meaning requires the dissemination of information and the processing of information itself. Developing shared meaning requires that individuals not only understand the information they have, but also understand how others perceive it. Successful communication is the development of a shared understanding of the information and meaning attached to each participant. The program initiator's steps to invite community leaders and people who live 10 to 100 meters away to participate in the socialization of the Harum Citarum Program were effective. Synchronous communication is effective when the message is complex

and has a high diversity of information. The results of open interviews showed that the community shared their understanding and experiences during the socialization or after the socialization. Discussions continue during activities outside coaching. These findings indicate that direct socialization results in transactional communication. That shared understanding of communication will always develop situationally (Borg et al., 2020).

Based on the second hypothesis, the communication process approach is positively related to communication performance, as supported by previous research. The study indicates that planned communication integration can enhance message delivery effectiveness and participant engagement. Effective communication requires the creation and exchange of information to achieve mutual understanding, as explained by Kalogiannidis (2020), who emphasizes the importance of synchronous communication processes in improving coordination during program implementation. In the context of the Citarum Harum Program, the steps taken by program initiators to engage the community through direct socialization have proven to foster transactional communication, resulting in situationally appropriate mutual understanding. Research also indicates that synchronous communication is more effective for conveying complex messages, as it facilitates gradual information delivery with direct feedback from participants (Luxton et al., 2015). Thus, this structured, synchronization-based communication process approach significantly contributes to improving communication performance and collective understanding of the program's objectives.

In the third hypothesis, the analysis of the relationship between Communication Process and Task Performance has a positive relationship. According to the originator of the theory, the success of task completion must be supported by the communication process and communication performance. Communities will begin to retrospect information and produce conclusions. The community will utilize knowledge from information about the declining quality of river water and integrate it into a mental model. Interpersonal communication is closely related to task performance. So, the initiation of programs that act as important communicators to improve communication skills. The results of the outer model which produces low scores on the verification construct show that the government must be able to encourage people to be interactive in outreach activities. The results of open interviews show that the communication process in direct outreach does not provide practical prevention solutions. The conveyance process should ideally be adapted to the interests of the community to realize river water quality. Performance results from motivation and motivation shows a strong correlation with general measures of achievement. Observations in the field show that the community participates if they have seen the experience of river cleaning activities. The community will participate if they are involved in interactions with neighbors who have been involved in the task of picking up trash in the

river. The environmental service involves people who have participated with people who have not been assigned to prevent river pollution. So, the task of cleaning up sustainable plastic correlates with the increase in river water quality (Khan et al., 2020; Rhein & Schmid, 2020).

The findings of this study reinforce the third hypothesis, which posits a positive relationship between the communication process and task performance. Consistent with the underlying theory, task completion success heavily relies on effective interpersonal communication, a concept further supported by Norawati et al. (2022), who found that organizational motivation and commitment significantly influence employee performance through interpersonal communication. Additionally, strategic communication approaches, as proposed by Goldberg & Gustafson (2023), can enhance the effectiveness of communication campaigns by considering the reach, impact, and durability of messages in influencing public behavior. Field observations indicate that community participation in environmental activities increases through interactions among individuals who have previously participated in similar activities, highlighting the importance of a community-based communication approach (Atapattu et al., 2020). These findings emphasize the need for the government to design communication programs that prioritize direct interaction, with relevant and easily understandable messages to encourage sustainable collective action (De Sio & Weber, 2020). Thus, communication strategies based on active participation can significantly support the improvement of river water quality.

The practical implications of these findings suggest that integrating direct communication into waste management policies, such as through outreach activities or involving community leaders, can enhance public awareness and participation in waste management practices, including efforts to prevent plastic pollution in rivers.

In the fourth hypothesis, the analysis of Communication Performance with Task Performance has a positive relationship. Improved communication performance can affect task performance. Effective communication plays an important role in group coordination and solving pollution problems. When the government as the program initiator is able to communicate openly, the community will understand the tasks assigned. Communities as socialization participants are willing to share ideas for technical solutions to the plastic waste problem if they have the same interests. As a result, good collaboration was born on the day of sharing understanding of tasks. The research implications show that it is important to pay attention to aspects of communication performance in developing task performance. To produce good task performance ideally one must go through the stages of making an agenda for cleaning up trash, the ability to provide solutions to clean up rivers from plastic waste, and inviting the community to participate so as to create quality river water (Lelieveldt & Schram, 2023; Woldesenbet, 2021).

The findings of this study support the fourth hypothesis that communication performance is positively related to task performance, particularly in the context of group coordination and pollution problem-solving. A study by Lee & Kim (2020) emphasizes the importance of a structured communication framework, such as SBAR-R, which has been shown to enhance team coordination and decision-making in emergency situations. Based on the Media Synchronicity Theory, successful task communication requires media that support high synchronicity to ensure mutual understanding among participants. Research by Dennis (2008) also demonstrates that face-to-face communication, as a medium with high naturalness, enhances collaboration, reduces message ambiguity, and supports the completion of complex tasks. Therefore, these findings have practical implications, suggesting that high-synchronicity communication strategies can be implemented in waste management policies to improve community collaboration in addressing plastic pollution. This also reinforces the importance of a structured and direct communication approach in supporting the success of environmental programs (Simon, 2006).

The results of this study support the fourth hypothesis, which posits that effective communication is positively related to task performance. The study demonstrates that effective communication, such as the use of synchronous approaches in waste management programs, enhances group coordination and facilitates collaboration in addressing plastic pollution in rivers. The practical implication of these findings is that waste management policies would be more effective if they incorporate synchronous communication strategies, such as delivering messages openly and directly, to encourage active community participation in environmental activities.

CONCLUSION AND SUGGESTIONS

This study shows that effective communication is positively and significantly related to community task performance in plastic waste management in rivers. Synchronous communication facilitates the direct delivery of information, enhances shared understanding, and supports collaboration in carrying out environmental tasks. These findings highlight the importance of synchronous communication strategies in promoting community engagement in environmental programs.

Synchronous communication through direct socialization approaches, such as home visits and group discussions, has proven effective in accelerating information verification and enhancing community participation. This approach enables the community to provide feedback and relevant technical solutions to address plastic pollution. Consequently, synchronous communication strategies play a key role in fostering the collective understanding necessary for effectively carrying out environmental tasks.

The findings of this study have significant practical implications for plastic waste management policies. Integrating synchronous communication into

environmental programs can enhance the effectiveness of campaigns and increase community involvement in reducing plastic pollution. This strategy supports the development of new social norms that encourage sustainable collective behavior, particularly in areas facing acute plastic pollution.

This study makes a theoretical contribution by advancing Media Synchronicity Theory, specifically by highlighting the processes of conveyance and convergence in creating effective communication. These processes are crucial in building shared understanding, which serves as the foundation for improving community task performance. The findings enrich the application of the theory in the context of environmental communication, particularly in plastic waste management in rivers.

The next research could be more focused by exploring the environmental communication context within the government program Citarum Harum, specifically regarding river pollution caused by domestic waste in Bandung City and Regency. The first necessary study is to assess the effectiveness of synchronous communication approaches, such as door-to-door visits, in raising awareness and driving behavioral change among the community. Additionally, in-depth interviews with heads of households in the Citarum watershed can provide further insights into communication barriers and specific information needs.

Second, the research could evaluate the differences in responses between urban and rural communities to the program's socialization methods. This is important for identifying the most effective communication strategies, taking into account demographic differences, education levels, and socio-economic conditions.

Third, it is recommended to integrate digital technologies, such as interactive communication apps or local social media platforms, to expand the reach of socialization efforts. These technologies can deliver environmental messages dynamically and allow the community to provide real-time feedback.

Fourth, a participatory approach involving community leaders, local authorities, and non-governmental organizations can be explored to enhance the program's effectiveness. This study could assess the role of multi-stakeholder collaboration in promoting community compliance with sustainable waste management regulations in the Citarum area.

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