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RESEARCH ARTICLE

Characteristics of Knowledge in Socioscientific Decision Making

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Abstract
Socioscientific issues demand decision-making that uses knowledge, and understanding its key characteristics helps decision-makers use it effectively for informed and practical decisions. Using a constructivist epistemology, a symbolic interaction theoretical perspective, and grounded theory methodology, this study explores the characteristics of knowledge in decision-making during the COVID-19 pandemic. Twenty-five Grade 11 students from a public school in a province of the Philippines were purposively chosen based on selection criteria. In-depth interviews were conducted using validated interview guides until theoretical saturation was reached. The collected data were analyzed using Naeem et al.'s thematic analysis process. The findings revealed that knowledge in socioscientific decision-making is developing, subsumptive, selective, transformative, reason-constructive, compliance-directive, adaptive, dynamic, transferable, alternative-generating, emotive, and experience-based. Understanding these characteristics enables decision-makers, such as global leaders, policymakers, and knowledge managers, to enhance their decision-making processes, leading to more positive outcomes for societies and the global community, particularly during socioscientific crises.

Keywords: COVID-19; knowledge management; decision making; socioscientific issue; grounded theory

Introduction

Knowledge in knowledge management plays a crucial role in decision-making, particularly during socioscientific crises. It enables societies to manage information effectively and ensures decision-makers have access to the right knowledge when needed. By organizing, sharing, and applying knowledge, societies can make informed choices that improve performance and address urgent global challenges, such as those related to health crises (Cheng et al., 2022). In this context, knowledge becomes a vital resource, helping societies adapt to change, solve problems, and improve behaviors, ultimately leading to more efficient responses. Beyond immediate decision-making, effective knowledge management supports long-term societal goals by sustaining competitive advantages, fostering economic growth, and ensuring survival (Sethi, 2023). However, understanding how knowledge functions during a crisis is paramount, as it directly influences the speed and quality of decisions made under pressure.

Socioscientific issues, such as the COVID-19 pandemic, present complex, rapidly evolving situations that demand urgent, well-informed decisions to protect lives and resources. The pandemic highlighted the importance of effective knowledge management in crisis situations (Zaerkabeh et al., 2024). During this time, societies were able to quickly mobilize various institutions to gather, distribute, and share information, which was vital for coordinating a response (Zontek & Lipianin-Zontek, 2024). Proper management of knowledge helped to organize

vast amounts of data, reduce misunderstandings, and ensure decision-makers had timely, accurate information to guide their actions (Zaerkabeh et al., 2024). Yet, the complexity of managing knowledge during a crisis cannot be overstated. Information often becomes disorganized, incomplete, or contradictory, complicating the decision-making process. For example, during the COVID-19 pandemic, fragmented knowledge and the spread of misinformation slowed down the decision-making process (González et al., 2024), hindering an effective response (Sontag et al., 2021). This situation underscores a critical gap in our understanding of how knowledge impacts decision-making during crises, calling attention to the need for a deeper understanding of the characteristics of knowledge to enable quicker and more effective decisions in such challenging times.

The significance of knowledge management during socioscientific crises extends beyond pandemics and is integral to addressing broader societal challenges, such as poverty, environmental degradation, and social inequality, which are central to the Sustainable Development Goals (Upadhyay & Patel, 2023). As Dawha (2024) emphasizes, effective knowledge management is a key enabler of progress toward achieving these global objectives. However, despite the clear value of knowledge management in addressing societal challenges, many sectors still struggle with implementing effective knowledge management practices (Leal et al., 2022). The COVID-19 pandemic, for instance, demonstrated how poor knowledge management led to unreliable information and ineffective knowledge-sharing practices (Hubbart, 2023), which resulted in missed opportunities and weakened decision-making, ultimately exacerbating the crisis and its consequences (Birdsall, 2022).

Given these challenges, it is critical to improve our understanding of how knowledge is characterized and applied in decision-making during socioscientific crises. A deeper insight into these characteristics can help bridge the gaps in crisis response and enhance decision-making practices. This study aims to explore these characteristics and offer valuable insights for decision-makers, including global leaders, policymakers, and knowledge managers, helping them improve knowledge management practices to make informed, practical decisions in future crises. By understanding and leveraging knowledge more effectively, decision-makers can mitigate the negative impacts of crises, benefiting societies and communities at large.

This study examined the characteristics of knowledge in the context of COVID-19 decision-making by answering the following questions:

1. What are the characteristics of knowledge in socioscientific decision-making?
2. How do knowledge characteristics influence socioscientific decision-making?

Review of Related Literature

Knowledge Creation

The nature of knowledge has been a central topic of philosophical discourse, with classical theories often defining it as a justified true belief (Gruber, 2023). However, this conception is not universally accepted, as various philosophical schools offer differing perspectives on how knowledge is acquired and validated. Felgner (2023) and Rizma and Dewi (2024) engage with the traditional debates between rationalism and empiricism, two foundational approaches to understanding knowledge. Rationalists, including notable figures such as Plato, contend that knowledge is primarily derived from reason and intellectual reflection, while sensory experience is deemed unreliable and potentially misleading. This perspective emphasizes the role of pure reason in the acquisition of knowledge, asserting that intellectual reflection alone is sufficient for understanding. In contrast, empiricists argue that knowledge arises from sensory experience, positing that interaction with the external world is integral to shaping our cognitive framework. Critics of rationalism underscore the importance of sensory input in forming beliefs, advocating for an interactive process between perception and cognition in the construction of knowledge.

In response to these dichotomous views, Gładziejewski (2022) presents a more integrated approach, suggesting that knowledge emerges from the interplay between rational thought and sensory experience. By challenging the traditional division between reason and experience, Gładziejewski's perspective provides a nuanced understanding of how knowledge is formed, emphasizing that both cognitive reasoning and embodied experiences contribute to the process of knowing. This integrated viewpoint offers a more holistic view of human cognition, wherein both intellectual and sensory inputs are recognized as essential components in the construction of knowledge.

This perspective is consistent with the traditional tripartite model of knowledge, which posits that knowledge consists of three essential elements: belief, truth, and justification. As outlined by de Grefte (2021), simply holding a belief is insufficient to claim knowledge; the belief must also be true and justified. Without truth, justified beliefs may not reflect reality accurately, and without justification, a true belief could merely be coincidental, occurring by chance rather than through reliable reasoning. de Grefte further argues that both reasoning and sensory experience are critical for ensuring the justification and truth of beliefs. Thus, knowledge is not merely about holding true beliefs but also involves a process of justification through logical reasoning and empirical evidence. This view reinforces the idea that knowledge is an interaction between rational thought and sensory experience, where both are required to establish a well-founded understanding of the world.

Knowledge Types and Characteristics

The relationship between knowledge and decision-making is multifaceted, with various metaphors and frameworks offering different perspectives on how knowledge is conceptualized and applied in decision-making processes. Bolisani and Bratianu (2017) utilized several metaphors to explore the dimensions of knowledge, each of which provides a unique lens through which to understand its nature. The Knowledge as Stuff metaphor conceptualizes knowledge as a tangible, quantifiable entity whose value diminishes when shared or stored. In contrast, the Nugget Metaphor portrays knowledge as discrete units that, when combined, generate more complex ideas. However, these units often lack meaning unless placed within a broader context. The Iceberg Metaphor distinguishes between explicit and tacit knowledge, suggesting that only a small portion of knowledge is easily communicable, while the majority remains hidden and difficult to formalize. The Knowledge Flows metaphor emphasizes the dynamic movement of knowledge within and between individuals, highlighting the role of social networks and contextual factors in the diffusion of ideas. Lastly, the Energy Metaphor compares knowledge to a transformative force that impacts its surroundings over time and across contexts. These metaphors help illuminate the complex and evolving nature of knowledge, making it evident that knowledge is not just a static entity but a dynamic and context-dependent resource.

These perspectives align with the Theory of Knowledge Fields and Knowledge Dynamics put forward by Bratianu and Bejinaru (2023), which categorizes knowledge into three broad domains: Rational Knowledge, rooted in logical thinking; Emotional Knowledge, shaped by emotions and unconscious responses; and Spiritual Knowledge, which involves personal values and principles guiding decision-making. This model highlights how knowledge from different domains can interact and transform, leading to continuous change. It offers a comprehensive view that integrates cognitive, emotional, and spiritual elements, thereby enriching our understanding of how knowledge influences decision-making.

In addition to these theoretical frameworks, knowledge is often classified into two broad categories: tacit and explicit knowledge. Tacit knowledge, as described by Oranga (2023), is deeply personal, context-dependent, and challenging to formalize, making it difficult to communicate or transfer effectively. On the other hand, explicit knowledge is easily codified, communicated, and shared across various platforms. Baruwa and Shutaleva (2022) further differentiate between "know-that" and "know-how", where "know-that" pertains to factual or propositional

knowledge about the world, while "know-how" refers to procedural knowledge that involves the skills and abilities required to perform specific tasks. Tigranyan (2023) introduces another distinction between practical and theoretical knowledge, noting that practical knowledge is gained through direct experience and action, providing the foundation for understanding real-world phenomena, while theoretical knowledge is based on abstraction and generalization of empirical data, which requires validation through practical application.

In the context of problem-solving, Braithwaite and Sprague (2021) underscore the importance of both procedural and conceptual knowledge. Procedural knowledge involves understanding the specific steps or cognitive algorithms needed to solve a problem, providing a systematic approach to finding solutions. On the other hand, conceptual knowledge is a more comprehensive construct that encompasses categories, relationships, principles, and representations that shape one's understanding of a problem. Said et al. (2022) build on this framework by classifying cognitive knowledge into three types: declarative, procedural, and strategic knowledge, all of which are regulated through metacognitive processes. Declarative knowledge refers to factual information and assertions about the world, as well as an understanding of the factors that influence human cognition. Procedural knowledge pertains to the execution of specific tasks and skills, while strategic knowledge or conditional knowledge involves an awareness of when and why certain strategies are most appropriate. These different forms of knowledge work together to facilitate problem-solving by providing a comprehensive foundation for decision-making. Through the integration of these knowledge types, individuals are able to select the most suitable strategies and make informed decisions based on the context at hand.

Knowledge in Socioscientific Decision Making

The relationship between knowledge and decision-making has been the subject of ongoing scholarly debate, with various studies highlighting the critical role of both content and contextual knowledge in guiding reasoning processes. While a significant body of literature emphasizes the importance of content knowledge in decision-making, others argue for the influence of personal experiences, intuition, and psychological factors. Lacorte (2024) contributes to this discussion by examining the interconnections between cognition and emotion, suggesting that both knowledge-based and non-knowledge elements influence decision-making. Despite these differences in perspectives, the broader literature consistently underscores the essential role of knowledge in making informed decisions, particularly within socio-scientific contexts. Cebesoy and Rundgren (2021) defined socioscientific issues as complex, ill-structured, and open-ended authentic and debatable issues that do not have definite solutions, which require reflective decision-making reasoning by considering various propositions and consequences of other decisions to negotiate. Murray et al. (2021) demonstrated the importance of practical decisions, involving content and contextual knowledge, in guiding protective behaviors during the COVID-19 pandemic, emphasizing the importance of contextual factors in decision-making. Sparks et al. (2022), meanwhile, focused on the role of knowledge in socioscientific argumentation, highlighting how individuals must engage with their background knowledge while considering the broader social, cultural, and ethical contexts in which socioscientific decisions are made (Lee & Tran, 2023).

Content knowledge, which encompasses the concepts, principles, theories, and facts within a given domain (Ofodu & Jımola, 2024), is fundamental to effective decision-making, especially in complex socio-scientific issues. Its application enables individuals to comprehend the complexities of the issue at hand, critically evaluate alternative solutions, and make well-informed decisions based on scientific literacy and critical thinking (Ardwiyanti & Prasetyo, 2020). However, the relationship between content knowledge and decision-making is not always direct or straightforward. For instance, Lee and Tran (2023) found no significant correlation between content knowledge and students' argumentation skills, attributing this to the challenges of translating theoretical knowledge into real-

world applications. Similarly, Cebesoy and Rundgren (2021) reported that participants in their study often used limited scientific evidence to support their decisions. Nonetheless, Lee and Tran argue that content knowledge remains essential in the decision-making process, particularly in the context of social issues, as it influences an individual's capacity to reason and engage meaningfully in discussions.

In decision-making scenarios, information gaps arise when an individual or system lacks sufficient knowledge to make an informed choice (Santos, 2023). While acquiring new facts is important, the integration of contextual knowledge plays an equally critical role in effective decision-making (Reddy & Revathy, 2024). Contextual knowledge refers to the broader environmental and situational factors that interact with the decision-maker, influencing their choices (Berrah & Clivillé, 2023). By integrating contextual knowledge, individuals can relate new information to existing experiences and understand complex situations more thoroughly (Harisatunisa & Sauqi, 2023). For example, contextual knowledge has been shown to enhance numerical reasoning (Kim et al., 2022) and improve an individual's ability to apply theoretical concepts to real-world problems (Pratiwi & Widjajanti, 2020). Reddy and Revathy further argue that without a contextual understanding, content knowledge alone is insufficient to address real-life challenges effectively. Moreover, the dynamic nature of decision-making, shaped by the interaction between individuals and their environment, has garnered increasing attention. Decisions are influenced not only by stable personal traits, such as values, goals, and preferences, but also by situational factors that emerge within specific contexts (Constantino et al., 2021). This suggests that decision-making is not a static process but one that evolves over time, influenced by the context in which it occurs.

Both content and contextual knowledge are indispensable in shaping effective decision-making. While content knowledge provides the foundational understanding of scientific concepts, contextual knowledge enables individuals to apply these concepts in practical, real-world scenarios. The integration of both knowledge types allows individuals to make informed decisions, particularly in complex socio-scientific issues, and prepares them to navigate decision-making in a variety of contexts. The importance of cultivating both types of knowledge is critical in preparing individuals for decision-making during socio-scientific crises, where context and evidence-based reasoning are paramount.

Methodology

Research Design

This study aims to investigate the characteristics of knowledge in socioscientific decision-making through a constructivist epistemological framework, a symbolic interaction theoretical perspective, and grounded theory methodology. To collect data, in-depth interviews were conducted with purposefully selected Grade 11 learners, utilizing a validated interview guide. Data collection continued until theoretical saturation was achieved. The interview transcripts were subsequently analyzed using thematic analysis to develop the grounded theory.

Informants and Sampling

A total of 25 informants were included in the study, based on specific selection criteria. They were Grade 11 students from a rural public school in the Philippines, residents of one of the five catchment communities associated with the selected school, and top learners from two class sections. The selection of top learners in grounded theory research enables the collection of rich, varied data, helping advance theory development and the formation of robust conceptual categories. The decision to include 25 informants was based on the principle of theoretical

saturation, which aligns with the recommendation by Sarfo et al. (2021) that a minimum of 20 participants is appropriate for grounded theory research.

Table 1 presents the informants' profiles. Pseudonyms were assigned to preserve their anonymity.

Table 1. Profiles of the Informants of the Study

Informant	Age	Sex	Academic Status
Margarette	16	Female	With High Honors
Flavien	15	Female	With Honors
Hermomelyn	15	Female	With Honors
Moira	15	Female	With Honors
Ian Rey	15	Male	With Honors
Jellah	17	Female	With Honors
Nicole	15	Female	With Honors
Sam	15	Male	With Honors
Kristine	15	Female	With Honors
Martin	15	Male	Top 10
Jamaica	16	Female	Top 10
Ina	15	Female	Top 10
Jairus	15	Male	Top 10
Jonalyn	15	Female	Top 10
Carlo	15	Male	Top 10
June	15	Male	Top 10
Jhonyca	15	Female	Top 10
Jovelyn	16	Female	Top 10
Ian Mar	16	Male	Top 10
Anna Marie	15	Female	Top 10
Darlyn	16	Female	Top 10
Genevive	16	Female	Top 10
Allen Troy	16	Male	Top 10
Jay Ann	17	Female	Top 10
Khatte	16	Female	Top 10

Data Gathering Instruments

An interview guide was developed to explore how informants applied their knowledge in COVID-19 decision-making. The guide included questions that were validated by experts in the fields of Science Education, Social Science, and Psychology. Additionally, the questions were translated into the informants' native language by local experts to ensure clarity and context. Data were collected through audiovisual recordings, which were made using cameras, microphones, mobile phones, and laptops. Observation notes were also taken on blank paper using pens to supplement the recordings.

Data Collection Procedure

Data were collected through individual interviews. Consent and assent forms were obtained from both the informants and their parents prior to participation. On the day of the interviews, the informants underwent

screening by a registered guidance counselor and the school nurse, and clearances were provided before proceeding to the data collection site.

Interviews were conducted using a semi-structured interview guide. Trigger questions were posed to the informants, with their responses immediately analyzed to inform probing and follow-up questions. Simultaneously, key response codes and emerging themes were noted and later reviewed to guide the development of subsequent trigger questions for the next informant. This iterative process allowed the researcher to verify prior findings, refine responses, and identify additional dimensions of the themes. Interviews were recorded and observed for relevant informants' behaviors. A total of three to six interviews were conducted per day over a five-day period. Interviews continued until theoretical saturation was reached, as indicated by repetitive codes and themes, and the absence of new insights. Saturation was achieved in the 25th interview.

Data Analysis Procedure

Audio files were manually transcribed, and the transcripts were cross-referenced with the audiovisual recordings and notes taken by the researcher to validate the data. Thematic analysis was conducted following the process outlined by Naeem et al. (2023). The analysis involved the following steps: (1) transcription, familiarization with the data, and selection of relevant quotations; (2) identification of keywords; (3) coding the data; (4) developing themes; (5) interpreting codes and themes to generate conceptual insights; and (6) constructing a conceptual model upon achieving theoretical saturation. The process was iterative, with the researcher simultaneously reviewing the data and adjusting codes and themes to confirm that saturation was reached and the grounded theory was developed.

Trustworthiness

The trustworthiness of the findings was ensured through the use of technically reviewed and ethically examined data collection methods and analysis procedures, overseen by experts in Science Education, Social Science, and Psychology and Guidance. A validated interview guide, translated locally, was employed in accordance with the guidelines set forth by the Philippine Health Research Ethics Board (2022). The interviews were conducted only after clearance was obtained from a registered guidance counselor and the school nurse, confirming the readiness of the informants. To further strengthen the credibility of the data, multiple data sources from interviews, audiovisual recordings, and observation notes were triangulated to validate the informants' responses and refine the emerging themes. The integration of interdisciplinary expertise, adherence to ethical standards, and the systematic triangulation of data sources collectively ensured the robustness and dependability of the findings.

Results

The informants' responses demonstrated knowledge as components of decision alternatives considered in their decision-making. Among the types of knowledge used, descriptive knowledge of COVID-19 situation served as the foundation from which other forms of knowledge were related. Generally, Genevive, Jay Ann, and Ian characterized the situation as a widespread and infectious disease. They shared:

- Genevive*: "Ma[ka]infect. Virus."* (Infectious virus)
- Jay Ann: *"sakit..."* (disease)
- Ian: *"pandemya"* (pandemic)

From the pandemic situation, the informants became more specific in their description of the nature of the COVID-19 virus, describing it as something that can easily spread through the air via droplets released when coughing. Ian Rey, Ina, and Johnyca mentioned:

- Ian Rey: *"molecule and droplet… Sa ubo"* (molecule and droplet… Through coughing)
- Ina: *"madara sa hangin"* (can be transmitted through air)
- Johnyca: *"It can spread easily… close contact"*

Relating their knowledge of the pandemic and the virus to its impact on the human body, the informants associated the virus with various symptoms. These include fever, sore throat, loss of sense of smell, taste, and appetite, similar to those of the flu, which, if left untreated, could be deadly. Kristine, Flavien, Allen Troy, Nicole, and Sam said:

- Kristine: *"hilanat"* (fever)
- Flavien: *"sore throat… dura ka panglasa, sir"* (Sore throat… loss of sense of taste, sir)
- Allen Troy: *"ubo…[dura] pangsmell… daw trangkaso"* (cough… loss of sense of smell…flu-like)
- Nicole*: "dura gana sa pagkaon… diarrhea"* (loss of appetite… diarrhea).
- Sam: *"makapatay"* (deadly)

Combinations of the informants' descriptive knowledge of the pandemic situation, the virus, and its effects on the human body formed the foundation upon which their other types of knowledge relate to form decision alternatives used during their decision-making about COVID-19. As their knowledge forms interact, they develop, subsume each other, select related concepts, transform into other knowledge forms, construct reasons, inform compliance, adapt to the situation, use concrete representations, contextualize, generate alternatives, express emotions, and integrate their previous experiences. All of these, in turn, define the characteristics of knowledge in the decision-making process.

Knowledge, as developing, describes the accommodation of related knowledge to improve the meaning of the decision alternatives of the informants. Generally, the produced alternatives generally provided the informants with improved structures, better awareness of associated information, and the development of easier courses of action. According to Jonalyn and Jellah:

- Jonalyn: *"Gaimprove"* (It improves)
- Jellah: *"Naga-easy, sir, kay naga-learn ka bago nga easy ways"* (It becomes easier because you learn easy ways).

Related to this, when they were asked to compare their knowledge of handwashing practices before and during the pandemic, their practices were described as less prescriptive and sometimes complied with. The change suggested their consideration of new knowledge forms, including their knowledge of the pandemic situation, the virus, and its impact on the human body. This development of previous understanding led to stricter performance and compliance with such practices. As described by Nicole and Johnyca:

- Nicole: *"Hugas lang, sir"* ([simple] handwashing, sir)
- Johnyca: *"Waay gid tig ano [proper handwashing]"* (There was no [proper handwashing])

On a wider scale, this developing knowledge claim is substantiated by the continuing changes in local policies related to health protocols and their implementation throughout the later stages of the pandemic. Margarette and Carlo said:

- Margarette: *"Pagwa sa balay. Na-learn ko na pwede na magwa"* (Going out of the house because I learned it is already allowed).
- Carlo: *"Pagsuksuk facemask, mas okay run, sir"* (In terms of wearing of face masks, it is already okay, sir. It is okay that we may not wear them anymore).

Knowledge as subsumptive means that knowledge structures incorporate related knowledge into bigger, more comprehensive structures. As they are subsumed, the integrated knowledge relates to and creates a more cohesive and comprehensive framework for understanding. For example, when interviewed about immunity, informants discussed the incorporated concept of vitamins, part of which was composed of their knowledge of its sources. Jellah, Jonalyn, and Kristine shared:

- Jellah: *"Rako nga Vitamin C…may samo man nga iban [nga supplement]… Healthy foods lang, sir"* (A lot of Vitamin C… and [other supplements]… Healthy foods, sir)
- Jonalyn: "Apples and oranges"
- Kristine: *"Eat nutritious food, sir. Mga gulay"* (vegetables).

Knowledge structures on immunity, vitamins, and their sources were integrated, forming strategies used to prevent infection with COVID-19. When asked about the preventive measures they take to avoid infection, the informants referred to the resulting meaning from the integration of considered knowledge forms, which served as reasons for their decision alternatives. In the interview, Jellah revisited her knowledge of immunity, vitamins, and their sources, and integrated these with her knowledge of the pandemic, the virus, and its impact on the human body, which composed her preventive strategy. She advised:

- Jellah: *"Kung kulang sa nutrisyon, sir, ang isa ka tawo kag indi healthy tana te dasig tana malatnan. Makabato ang resistensya mo, sir. Dapat safe sa pagkaon, sir. Kay hambal nanda kuno, sir, amo ran makaano [makaparayo] ka COVID-19"* (If a person is undernourished, they are not healthy. Then they can easily get infected. Your immunity can fight [the infection]. You have to eat healthy food. They say this prevents COVID- 19).

Knowledge as selective describes decision alternatives as composed of context-related knowledge forms. Depending on the focus of the broader knowledge structure, composing knowledge forms were evaluated based on their relevance to the context. Conversely, those considered irrelevant, despite their relatedness, were excluded. Taking previous knowledge on immunity, vitamins, and their sources as an example, only the knowledge of the sources was found significant by the informants when asked how they could obtain them during the pandemic. Ina and Darlyn explained:

- Ina: *"Kung mabakal ka, sir, eh"* (When you buy them sir)
- Darlyn: *"Kag kung gusto may ipabakal, ipaulayhon da"* (If you need them to buy them for you, they would)

On the other hand, the knowledge that composed their responses was not mentioned in the previous interview in the context of immunity. Students' responses showed the use of their knowledge of fruits and vegetables, but without the subsumed concepts of vitamin C and nutrition, similarly highlighting knowledge characteristic as selective.

Knowledge as transformative defines knowledge as changing into other knowledge forms. While the informants' understanding of the pandemic, the virus, and its impact on the human body was descriptive in nature, these knowledge forms, when integrated with other knowledge types, were transformed into action-oriented steps as procedural knowledge. In this regard, during the interview, informants shared their descriptive knowledge of the types and purposes of facemasks, which then informed their procedural knowledge on how to wear them. Jellah, Jonalyn, and Jay Ann shared:

- Jellah: "Surgical mask"

- Jonalyn: *"Mafilter ang virus"* (to filter the virus)
- Jay Ann: *"Duwahon kung available. Para mas indi pa gid kasulod [ang virus]"* (Double the mask when available. So, it [virus] won't easily get in).

From this understanding, informants were tasked with demonstrating the proper wearing and removal of their face masks. Informants were observed holding the earloops instead of the mask filter, ensuring the mask was appropriately fitted, and clipping the metal wire. On the other hand, students first held the earloops and then removed their masks when instructed to do the opposite. This demonstration shows how their descriptive knowledge was transformed to another form while being used in decision-making.

Knowledge is also reason-constructive, as composing knowledge forms integrate their meanings with each other to create a cohesive and comprehensive reason for a decision alternative. As various decision alternatives were considered in the decision-making process, these choices involve unique combinations of knowledge, causing their reasons to vary, thereby guiding the decision maker. For example, in terms of disposing used masks, informants shared burying them in the ground, throwing them in trash cans, and burning them. According to Kristine, Darlyn, and Nicole:

- Kristine: *"ginalubong para madunot, sir"* (We bury it on the ground to let it decompose)
- Darlyn: *"Haboy sa basurahan. Tapos sa dumpsite"* (Put in the garbage bin. Then, to the dumpsite)
- Nicole: *"Iban gahambal kuno nga safe kung sunugon"* (Others say that it is safer if we burn it)

Each decision alternative contained its unique reason, which informants evaluated to help them decide. In this case, they considered the negative consequences of each choice, such as the smoke emitted when used masks were burned and the unpleasant smell produced when these were left in the dumpsite. Accordingly, most of them chose to bury their used masks. Sam and Flavien described:

- Sam: *"Kung sunugon mo, sir di ba maaso? Dangerous gyapon"* (When you burn it, it creates smoke, right? So, it is still dangerous).
- Flavien: *"Waay da man ran dyan nasunog [in dumpsites]. Nagabaho"* (They do not burn the garbage [in the dumpsites]. It produced an unpleasant smell).

It is also from this situation that knowledge in decision-making is compliance-directive. Based on the evaluation of the reasons involved, informants determine the choices with which they are most likely to comply. Accordingly, they considered the negative and positive consequences of each option, from which their decision was made. This is similarly shown in their responses during interviews when asked about their considerations regarding whether to wear or not wear their facemask. Nicole and Martin mentioned:

- Nicole: *"Tam-an ka budlay, sir, kung indi ka magmask kay tam-an ka strikto [ang pag-implement] tulad nga pandemic bala aw, gamay lang nga magwa kaw tapos waay kaw tig mask nadakop ka dayun"* (It is hard, sir. If you do not wear your mask and go out, you'll get arrested).
- Martin: *"Masuksuk ka mask para magtawhay dun. Nga nagalagaw ko bala. May imaw ako nga pwede ko kaparapit, and mabalik ang mga memories ko kang san-o nga wala pa nagabot ang pandemic"* (We should wear our masks. So that I can now roam around, that I have someone I can be with, and bring back my memories before the pandemic).

Compliance or non-compliance with the decision varies over time as new knowledge forms are considered and integrated into decision alternatives, affecting earlier choices. Previous findings suggest that new knowledge forms should be relevant to the context of the choices. Hence, as new knowledge is added, options become more cohesive

and comprehensive, while also becoming adaptive, especially when situational knowledge is incorporated. For example, in terms of their practice of physical distancing and wearing facemasks, informants considered the crowd density and interaction, and ventilation of the area as situational knowledge, respectively. Jamaica and Jairus mentioned:

- Jamaica: *"Daw gamay lang kamo, sir [sa barangay], mo… Kung mahalubilo ka sa iba, sir, haw, mas kinanglan mo magfacemask… If ang inyo part ka family gaubra sa mga rako tawo, sa hospitals or mga malls, exposed sanda sa rako tawo"* (Seems like there are only a few people in rural areas, sir… If you interact with others, you need to wear your mask… If a part of your family works in places of social gathering, hospitals, or malls, they are exposed to a lot of people).
- Jairus: *"If indoors, kung may proper ventilation [indi na magsuksuk]"* (If indoors, if they have proper ventilation [do not wear facemask anymore]).

Further investigation of the informants' responses describes how knowledge in decision alternatives is dynamic, moving from abstract to concrete, its opposite, or somewhere in between, depending on the new knowledge added. This change is eventually settled when all knowledge available to the informant is considered, resulting in abstract-dominant, concrete-dominant, or abstract-and-concrete-dominant knowledge forms. In the context of the pandemic, decision-making requires that decision makers to base their choices on both abstract and concrete knowledge forms, with each contributing relevant concepts as abstract reasons and their application in real situations as concrete reasons, guiding decision-making.

These claims were based on Kristine's abstract knowledge that the COVID-19 virus is spread through the air, as well as her concrete knowledge of the actual situation, in the presence of 1-meter distance foot markers in establishments. This formed her abstract-concrete knowledge as the reason for maintaining a 1-meter physical distance to avoid harboring the COVID-19 virus, an alternative she chose that directed her compliance with the protocol.

- Kristine: *"Kay diba ga-spread ang COVID-19 tungod sang hangin?..."ay kahigkahig ran bala… Mas budlay para indi madukot"* (COVID-19 is spread through the air, isn't it?... They have foot markers… It is more difficult to be too close to each other).

A review of the informants' responses shows that the characteristics of knowledge are transferrable across contextually related decision alternatives. However, it remains that the form of that knowledge must be relevant to the context of the decision options for its meaning to be effectively used. For instance, their abstract knowledge of the airborne mode of transmission of the COVID-19 virus was transferred from maintaining physical distancing among individuals to the implementation of community border restrictions in a larger scale. Sam and Jonalyn explained:

- Sam: *"Kay kung mas rayo [ikaw]. Mas safety. Makacontact kalang sa isa ka tao nga may COVID, malatnan ka dayun."* (If you are more distant, much safer. A contact with an infected person means you become infected too.).
- Jonalyn: *"Indi kaw kagwa [sa barangay borders] kung waay gate pass"* (You cannot pass [the community borders] without a gate pass)

Interestingly, this abstract knowledge served as shared reasoning between the two previously presented situations. This shows its ability to provide a general basis for decision-making. However, adding contextual knowledge, like their understanding of maintaining 1-meter physical distancing and the border restrictions in place, makes it work in the actual situation. In the interview, for example, Darlyn focused more on abstract reasons in her decision to stay distant for safety, while Carlo relied more on concrete reasons for staying distant to avoid close physical

contact. Regardless, their explanations still maintained a combination of the two knowledge forms, with one dominating the other. They shared:

- Darlyn: *"Para maging safe… Para sa imo, sir, daw ginaubra mo man nga maavoid ang amo karan, sir"* (To be safe… For you, sir, you do that to avoid that [COVID 19], sir)
- Carlo: "*Maavoid pa gid ang too much contact… Ma-contact ka sa isa ka tao na may COVID, malatnan ka dayun"* (To avoid too much contact… When you had contacted a person with COVID, you'll get infected).

The use of various knowledge forms to compose decision alternatives leads to changes in the resulting structure for decisions, with the removal or addition of a knowledge form. Accordingly, alternative choices were formed, but with the same goal. In the interview, informants were asked about the absence of soap during handwashing, and they provided various methods to remove the virus from their hands. Jairus, for instance, referred to other brands of soap, increasing the intensity of hand rubbing, and using sanitizer. He advised:

- Jairus: *"Kung ano lang available nga habon. Bawi lang sa pulas… Sanitizer"* (Make use of whatever soap is available. Do rub your hands more… Sanitizer).

The decision alternatives produced triggered emotions that motivated informants to achieve their COVID-19 goals. Their answers showed that these emotions focused on avoiding negative consequences and achieving positive outcomes, as they explained when talking about getting their vaccine shot. Kristine's motivation was centered on preventing harm, while Martin's was focused on achieving a healthier immune system. Regardless, both emotions aimed at the same goal of getting a vaccine shot and staying safe, confirming previous findings on goal-sharing. They explained:

- Kristine: *"Para indi ka dun matam-an ka virus, sir. Kung wala kapa kaagi virus"* (So you won't be severely affected by the symptoms of the virus if you were not infected before),
- Martin: *"Maimprove imo immune system"* (To improve your immune system).

Knowledge in decision-making also considers the previous experiences of informants or others, which influence their pandemic choices. These direct and indirect experiential knowledge provided them with additional insights to reason their compliance or non-compliance with getting vaccinated. Some informants, for instance, reflected on their negative past experiences, while others listened to the advice of others, which sometimes conflicted with each other. Moira, Anna Marie, and Flavien shared:

- Moira: *"Kay hambal ni tita ko, sir, mas okay kuno magpabooster kay nami kuno ang immunity kung magpabooster kaw… Indi sugtan [ka parents]"* (My aunt said that getting a booster shot is a good thing to improve your immune system, sir… We were not consented [by our parents])
- Anna Marie: *"Nafainted ko sir"* (I fainted [previously], sir).
- Flavien: *"Sa inject palang, sir, grabe dun sakit ka ulo ko bala, sir, haw. Indi man ako gyapon kay indi ko gusto ang experience"* (With my previous injection, I experienced a severe headache, sir. I do not want still because I did not like the experience).

Informants also recognized direct and indirect positive experiences that they similarly consider in their decision making. Jairus and Darlyn explained:

- Jairus: *"Para maprotektahan ako against sa virus [nagpa-inject ako]"* (To protect myself against the virus, I got a vaccination shot…)
- Darlyn: *"Iban okay man. Tapos [vaccination]"* (Others were okay after getting a vaccination shot)

The positive and negative experiential knowledge available to them facilitated their critical reflection during the decision-making process. Kristine expressed:

- Kristine: *"May side sir nga daw nakulbaan ka tungod sang balita nga nabatian mo. May side man, sir, nga gusto mo para maprotektahan ang imo self"* (There is this side, sir, that you feel nervous because of the news you have heard. Then there is this where you want to because you need to protect yourself).

Discussion

The investigation revealed that descriptive knowledge about COVID-19 serves as the foundational framework for the decision alternatives among the informants. Although a variety of knowledge forms were considered, only contextually relevant knowledge was actively utilized in structuring the decision alternatives. This process of integrating diverse yet context-specific forms of knowledge creates a cohesive and comprehensive framework that supports the decision-making process. The concepts discovered complement the idea of knowledge integration and co-production outlined by Lösch et al. (2023), which Müller and Pyka (2022) further supplemented with the concepts of knowledge diffusion, recombination, and creation. Collectively, these theoretical frameworks describe how related knowledge forms are diffused, integrated, and recombined to co-produce and create a broader structure, such as the decision alternatives.

The descriptive knowledge exhibited by the informants reflects their understanding of the COVID-19 pandemic, including the nature of the virus and its impact on the human body. This aligns with the findings of Wiersinga et al. (2020), particularly regarding disease transmission, symptoms, complications, and management strategies. However, it was noted that the informants often used common lay terms, such as "loss of sense of taste" and "loss of sense of smell," which correspond to the medical terms "ageusia" and "anosmia," as described by Wiersinga et al. in the context of COVID-19 symptoms. According to Pandey (2023), this reliance on everyday language for medical terms reflects the informants' limited understanding of the disease and highlights the barriers that influence their learning. These barriers are primarily related to the type of vocabulary they have access to, which, for the informants, is shaped by sources such as media outlets, including television, social media, and informal conversations. These sources often focus on case updates, management strategies for infected individuals, and general pandemic information (Adekoya & Fasae, 2021), using simplified language and generalized terms to make complex information more accessible to the public. Tremaglio and Kraczkowski (2024) explained that simplifying medical terminology is an intentional strategy designed to reach a broader audience. By converting professional jargon into simpler, more accessible language, and providing clear definitions and explanations, communication becomes more effective. This strategy helps bridge the gap between experts and the general public, thereby enhancing comprehension (Ibrahim et al., 2021). While such simplifications may reduce the precision of technical terms, they ensure that crucial health information remains accessible and understandable to a wider audience.

Another noteworthy observation was the informants' tendency to use broad, generic terms, such as "flu-like" to describe COVID-19 symptoms and "deadly" for its complications. This approach reflects their use of broader terms that encompass a range of related meanings. Literature associates this practice with concepts of compiled knowledge (Qiu et al., 2024) and knowledge encapsulation (Maltsev & Yudanov, 2022), which describe the process of simplifying and organizing complex information into a more digestible format. This simplification facilitates the efficient transfer of knowledge and enhances communication among individuals and groups.

Generally, this informants' descriptive knowledge about the pandemic, the virus, and its impact on the human body formed the basis for integrating additional knowledge forms. This integration process led to the development of structures which meanings evolved with the addition or removal of knowledge components. Valsecchi et al. (2024) characterized this process as a conceptual change, wherein original knowledge structures are modified in response

to newly available information. This results in the creation of more accurate and comprehensive mental models, as evidenced by the informants' decision-making alternatives. Sen (2024) contextualized this process within the realm of knowledge management, describing its development in terms of the systematic creation, sharing, organization, and distribution of knowledge. Huo et al. (2024) further explained that these conceptual shifts lead to adaptations, which in turn influence emotional and behavioral responses.

As knowledge develops, the overall structure continuously incorporates relevant knowledge, with each component enriching the others, ultimately forming a unified concept that the informants use in decision-making. This process, referred to as knowledge subsumption, occurs when a specific concept is incorporated under a broader or more general category. Bolisani and Brătianu (2017) effectively illustrated this concept through their knowledge stock and flow metaphor, where knowledge flows economically between different forms, influencing the concepts of these forms and allowing the broader structure to adapt to varying contexts. For example, in the informants' responses, the concept of "fruits" not only includes the direct idea of fruits but also related concepts such as vitamins and methods for acquiring them during the pandemic. The concept of Vitamin C, which is critical for immunity, holds greater significance in discussions on health but becomes less central when the conversation shifts to methods of obtaining fruits. This demonstrates how knowledge, particularly in the context of strategic decision-making, is organized, logically connected, and expanded into a comprehensive structure (Gehringer, 2022; Goi et al., 2023).

Connected to the concept of knowledge subsumption is knowledge selection, which refers to the capacity of distinct knowledge forms to distinguish themselves and interact only with those that are most relevant to the current context. This mechanism allows the integrated knowledge structure to become more adaptive and responsive to the situation at hand. The findings suggest that knowledge can be shared across various domains, as long as the concepts remain pertinent to the context of the problem being addressed. Knowledge forms that are connected within the broader context are retained and constantly re-contextualized by the situation’s components to support effective decision-making. This aligns with the claims of various studies, which suggest that mental frameworks possess enough flexibility to incorporate diverse concepts and contexts while remaining selective and focused on those that are most applicable for learning and decision-making in a specific context (Holtrop et al., 2021). The informants also indicated that this merged knowledge structure proved more practical and efficient when applied to the real-world problem. This process closely correlates with the concepts of knowledge compilation (Qiu et al., 2024) and encapsulation (Maltsev & Yudanov, 2022), which describe how related knowledge forms are consolidated to enhance efficiency in their use.

As knowledge becomes selective, the integrated structure transforms into a multidimensional knowledge type, shaped by the meanings of the accepted knowledge forms. Toikka et al. (2024) categorized knowledge into two distinct forms: qualitative knowledge, which encompasses declarative, procedural, and conditional knowledge, and contextual knowledge, which involves the decision-makers’ attributes, the task at hand, and the approach to the strategy. Consequently, decision alternatives are comprised of these knowledge forms, with one dimension typically prevailing depending on the context of the situation. During the interviews, informants demonstrated their procedural knowledge when asked about how they manage their facemasks, while their conceptual knowledge became evident when asked about the rationale behind wearing them. This interplay between qualitative knowledge, supported by contextual knowledge, forms the strategic knowledge that informs practical actions, such as which parts of the mask to avoid touching when donning or removing it. By integrating various forms of knowledge, individual concepts transform into a merged meaning that adapts the original procedure, resulting in enhanced decision alternatives. The integration of conceptual and contextual knowledge in decision-making clearly illustrates how abstract concepts and situational factors evolve into informed and practical actions (Chaplinskyy & Subbotina, 2022).

The merged meanings of transformed knowledge serve as reasons that are evaluated during the decision-making process. Interestingly, once a choice is made, subsequent reasoning tends to exhibit selective bias toward the chosen alternative. The present study revealed that learners employed negative statements to dismiss alternatives, while neutral or positive arguments were used to support the chosen option. This selective reinforcement of decisions aligns with Cebesoy & Rundgen (2021) who found out that socioscientific decisions are driven by knowledge, rather than knowledge simply defining decisions. The tendency to reinforce pre-existing choices through supporting knowledge reflects a cognitive bias in the decision-making process, indicating the complex interaction between knowledge acquisition and post-decision reasoning.

While knowledge undeniably contributes to decision-making, it is not the sole predictor of decisions themselves. The findings revealed that although learners were aware of alternative options for mask disposal, a factor that supports the role of knowledge in generating alternatives (Litvaj et al., 2022) and evaluating decision-making mechanisms (Ishak & Elgeka, 2023), other influences also shaped their final choices. Notably, learners' decisions were influenced by non-cognitive factors such as concern for self and others, echoing Li's (2023) assertion that emotions, intuition, and beliefs play a significant role in shaping decisions. These findings suggest that decision-making in socioscientific contexts is multifaceted, with knowledge interacting with emotional and social factors to guide outcomes. Moreover, knowledge plays a critical role in guiding compliance with health protocols. However, the extent of compliance is not solely determined by knowledge but is also influenced by trust in government officials. Communities characterized by low levels of trust in authority often exhibit reluctance to fulfill obligations, diminished goodwill, and challenges in understanding others (Gans-Combe, 2022). This mistrust fosters unhealthy coping strategies and amplifies the influence of misinformation, as highlighted by Wright et al. (2022). Misinformation, while potentially incorrect, can strengthen individuals' confidence in their own ability to manage the situation, thereby reinforcing decision-making despite the presence of inaccurate information (Vally, 2021). These findings demonstrate complex interplay among knowledge, trust, and behavioral responses in times of crisis.

Compliance behaviors are also shaped by situational knowledge, which decisions adapt. Informants in this study described their understanding of the problem by identifying areas with high risk of COVID-19 transmission, emphasizing the importance of indoor ventilation to mitigate viral spread. This situational awareness, as conceptualized by Traeber-Burdin and Varga (2022), enabled informants to comprehend how various environmental factors influenced their conditions and, consequently, their decisions, specifically whether to wear their face masks or not. By integrating contextual information from their surroundings, the informants developed reasoning that directly influenced both their decision-making and their adherence to health protocols. This underscores the importance of situational awareness in changing decision-making contexts, allowing individuals to adapt their actions based on developing information and context-specific factors.

The integration of contextual knowledge into decision-making further illustrates its dynamic nature, transforming abstract or general knowledge into more operational and context-specific forms. Informants' responses revealed a continuous process of knowledge accumulation that gradually combined their conceptual understanding of the pandemic, the COVID-19 virus, and its impact on human health with the contextual structure of the situation. This process resulted in increasingly operational and contextually specific decisions. For instance, informants demonstrated awareness that maintaining the prescribed physical distance to limit exposure to the virus required adherence to foot markers indicating the appropriate distance. The integration of these conceptual and contextual components allowed informants to effectively utilize physical resources in their decision-making. This aligns with Liu et al. (2024), who emphasized that the incorporation of contextual knowledge can enhance decision-making by identifying and leveraging external resources, leading to more accurate, real-time, and informed choices. Levine

(2022) philosophically supports this view, describing it as an idealist-realist approach that bridges abstract knowledge and practical applications.

Further analysis of the informants' responses revealed the transferability of their knowledge across contexts. For example, their descriptive knowledge about the pandemic, the COVID-19 virus, and its impact on the human body was applied as a rationale for maintaining physical distancing and implementing broader community border restrictions. This cross-context application of knowledge is consistent with Dohn's (2021) perspective on shared knowledge characteristics. Dohn highlighted the importance of the situational characteristics of the new context in facilitating the attunement of knowledge from the original context for application. Similarly, Zheng et al. (2024) reported similar findings in their study on cross-modality knowledge transfer, illustrating how knowledge can be effectively transferred and generalized across various contexts. Poliseli (2020) further argues that conceptual knowledge is inherently transferable and applicable across a range of contexts, though it may have limited explanatory power in more specialized domains. Nevertheless, such knowledge remains valuable in addressing related challenges across different situations.

Notably, despite the contextual differences, both situations were driven by the same underlying rationale and shared goal, demonstrating the flexibility and adaptability of decision-making, particularly in complex or uncertain contexts. This is especially true when decisions are made to align with common objectives. In the case of the informants, physical distancing and the implementation of community border restrictions were viewed as essential measures to minimize human contact and ensure safety. Berrah and Clivillé (2023) contend that, despite variations in context, decisions tend to converge toward a shared objective, a perspective supported by Allan (2023), who asserts that decisions should be grounded in mutual understanding and shared interests. Likewise, Oliveira (2020) states that, despite differences in knowledge, individuals can collaboratively share their insights and apply tailored strategies to achieve common goals, which lies at the core of shared decision-making. This dynamic is further noted by Wasserman and Wasserman (2020), who argue that this process enables individuals to continually adapt their goal-setting in decision-making in response to evolving circumstances, ensuring that their decisions remain consistent with the shifting context.

In addition to the role of context in decision-making, the creation of alternative choices in pursuit of a shared objective was evident in the informants' responses. For instance, when their preferred brand of soap was unavailable, the informants resorted to alternative brands, rigorous hand rubbing, or the use of sanitizer. These findings illustrate how the removal of a primary concept can reshape the decision-making structure, prompting the emergence of alternatives that adapt to the situational context. This suggests that decision alternatives are shaped by the incorporation of the new context, which allows available knowledge to inform the decision-making process. Litvaj et al. (2022) argue that alternatives depend on the components present within the situation. Thus, decision-makers must carefully evaluate the context to make well-informed and practical choices.

Further analysis of the informants' responses revealed that, while these alternative choices aimed to achieve the same goal, there was a concerted effort to mitigate the negative emotions triggered by the situation. Informants indicated that their priority was to feel safe, which took precedence over the potential risks of infection. This decision-making process was influenced by their conceptual understanding of the pandemic, the virus, and its effects on the human body. In this context, both positive and negative emotions played a crucial role, creating a push-and-pull dynamic as informants sought the most informed and practical solution to alleviate their negative emotions. Doménech et al. (2024) observed that emotions typically transition from negative to positive, with positive emotions being associated with goal achievement. As a result, positive emotions acted as a motivating force, guiding decision-makers toward optimal choices and fostering adherence to these decisions.

The investigation further revealed that, although many students initially expressed hesitancy regarding getting their booster shots, they ultimately proceeded with the decision, driven by positive emotions related to safety. This

highlights the significant role of emotions in shaping decision-making processes, with one dominant emotion often guiding the final choice. Ngai et al. (2024) support this finding, suggesting that emotional intensities within different components of decision alternatives can create an emotional tug-of-war, which ultimately influences both choices and actions. This aligns with broader research on the role of emotions in cognitive processes, particularly within the context of decision-making (Tsopanova, 2023; Lacorte, 2024). The interaction of informants' emotions, such as fear, anxiety, and relief, helped them structure and prioritize the knowledge they considered in decision-making, leading to more informed choices when coupled with practical considerations.

In addition to emotional influences, direct personal experiences also played a pivotal role in the decision-making process. Informants shared negative experiences following their initial vaccinations, including fainting and severe headaches, which contributed to their initial hesitancy regarding the booster shots. These past experiences reflect the significant impact of previous knowledge and associated emotional responses on subsequent decision-making, which is consistent with the work of Schreiner et al. (2021). Their findings emphasize how past information and internal states can shape current decisions by providing a foundation for evaluating risks and benefits in future choices. This dynamic is particularly relevant when considering how individuals process information and adjust decisions based on both positive and negative past experiences.

Beyond direct experiences, the informants' indirect experiences were largely shaped by the advice of their parents, who ultimately held substantial influence over their decisions, regardless of whether the advice aligned with or contradicted the informants' preferences. This demonstrates typical Filipino cultural expectations wherein parental guidance is prioritized and children are expected to comply. Alampay (2024) notes that such traditional, authoritarian parenting styles often emphasize obedience and familial cohesion over individual autonomy. These expectations further reflect broader social values that prioritize mutual support within families, particularly in contexts that involve collective decision-making. Mamauag et al. (2021) affirmed that in these contexts, parental influence is central, with children's choices often being framed within the larger family dynamic. The findings suggest that within such cultural frameworks, parental guidance plays a significant role in shaping the decision-making processes of younger individuals.

Responses of the informants additionally suggest that experiential knowledge, whether directly or indirectly acquired, proved instrumental in helping them carefully assess the risks and potential outcomes associated with their decisions. The process of reflecting on past experiences allowed informants to critically evaluate the knowledge they used to justify their decisions, reinforcing the importance of reflective evaluation in decision-making. Rodenburg et al. (2021) connected this to the role of knowledge in helping individuals assess the risks of their choices, with previous experiences influencing future decisions. Similarly, Enekwe (2024) focused on the role of positive emotions in improving psychological expectations, which, in turn, influence behavioral decisions. Informants' willingness to embrace the potential risks associated with vaccination was partially driven by their positive emotional responses, which encouraged them to take informed risks for their long-term well-being. These interacting roles of cognitive and emotional reflections in decision-making demonstrates that both knowledge and emotions are important in making informed and practical choices.

The findings of this investigation identify key characteristics of knowledge in decision-making, including its developing, subsumptive, selective, transformative, reason-constructive, compliance-directive, adaptive, dynamic, transferable, alternative-generating, emotive, and experience-based nature. Decision-making processes are guided by both cognitive and affective evaluations. While the study's limitations, such as the specific context of the informants, research site, data collection method, and socioscientific issue investigated, are acknowledged, future research may incorporate diverse samples, varied study locations, mixed-method data collection approaches, and other socioscientific issues. Notwithstanding these limitations, the study contributes valuable insights into the role

of knowledge in decision-making, offering practical implications for decision-makers seeking more informed and practical choices.

The meaningful presentation of the categories found in this investigation is shown in Figure 1.

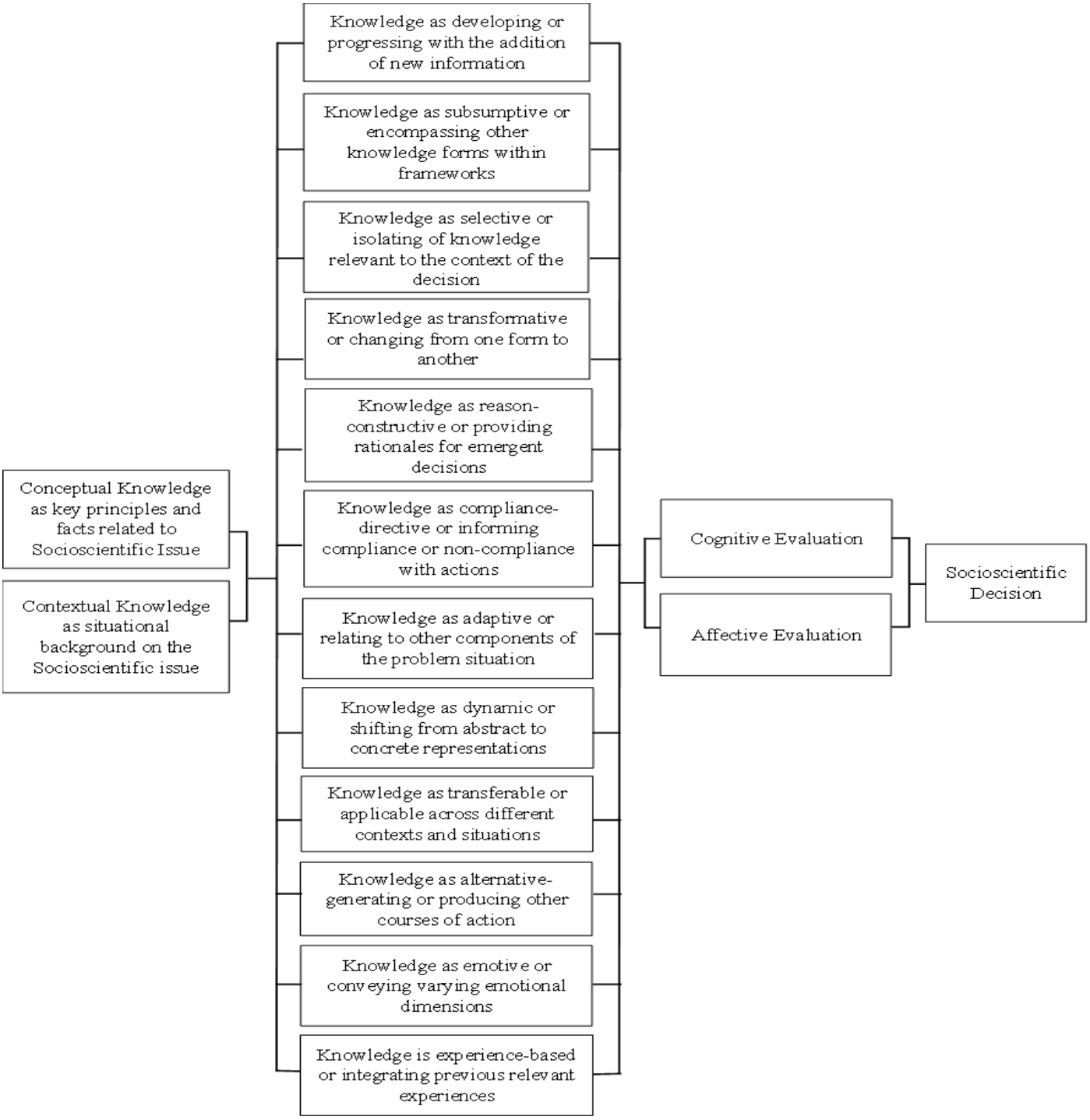

Figure 1. Characteristics of Knowledge in Socioscientific Decision Making

Conclusion

This study emphasizes the significant role of both conceptual and contextual knowledge in socioscientific decision-making. The integration of these knowledge types facilitates the development of informed and practical decisions,

which are essential for addressing complex socioscientific challenges. The various characteristics of knowledge, including its developing, subsumptive, selective, transformative, reason-constructive, compliance-directive, adaptive, dynamic, transferable, alternative-generating, emotive, and experience-based nature, describe the multifaceted decision-making process involved in socioscientific crises. While the findings are constrained by factors such as sample characteristics, research site, and data collection methods, they offer valuable insights into how knowledge influences decision-making. Future research should incorporate more diverse samples, research sites, and methodological approaches to further enrich these findings. This study provides guidance for decision makers, including global leaders, policymakers, and knowledge managers, in integrating varied and relevant knowledge to inform their decision-making process. Such integration can support positive decisions that benefit societies and the global community, especially during times of crises.

Declaration

The author declares that this manuscript is an original work and has not been submitted for publication elsewhere.

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Consent for Publication: All informants provided their written informed consent for the publication of their anonymized responses. The author grants this journal permission to publish his work.

Data Availability: The data may be obtained from the corresponding author upon reasonable request.

Authors contribution: The author was responsible for the conduct of this research.

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