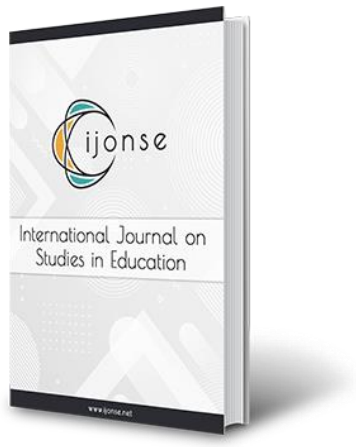

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Which Data Gathering Method is Superior: An Open-Ended Questionnaire or a Semi-Structured Interview?

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Which Data Gathering Method is Superior: An open-ended Questionnaire or a Semi-structured Interview?

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Abstract

The objective of this study is to conduct a comparative analysis of two qualitative data collection methods: semi-structured interviews and open-ended questionnaires, with a specific focus on codability. A total of twelve freshman college students, comprising two males and ten females, were involved in this study. A phenomenological case study approach was adopted in gathering and analyzing the qualitative data. The study centered around the participants' beliefs regarding some science-related phenomena. Data comprised written responses to open-ended questionnaires and those obtained through interviews. In both data collection methods, the open questions were alike, but the interviewer was allowed to delve deeper for further elaboration. The students' responses were inductively coded to discover patterns in the data. Two codes were allocated to these responses: "codable" and "non-codable." Codable responses encompass complete answers enabling the researcher to assign a code; conversely, responses requiring additional inquiry or elaboration, preventing the researcher from assigning a code, were deemed non-codable. The results indicated that almost all the data obtained through interviews was codable; whereas only 42% of the data obtained through the open-ended questionnaire was codable. Chi-square analysis further confirmed a statistically significant association between codable responses and interviews.

Introduction

Open questions serve as a method for eliciting information by prompting respondents to share their perspectives (Edenborough, 2002). Examples of such questions include inquiries like, "What are your opinions on...?", "How did you find X...?", and "What was it like at...?" These types of questions typically form the primary component of traditional interviewing techniques. However, they carry the risk of prompting lengthy and tangential responses from the interviewee. To mitigate this, variations of open questions may be employed to narrow the focus, such as prompting the respondent with queries like, "Tell me about the challenges you have faced at work recently," or "What sort of people did you interact with when you were selling product y?" In this study, open questions were utilized in both the questionnaire and interviews to elicit participants' thoughts. The systematic use of interviews as an approach in social research, aimed at exploring peoples' beliefs and perceptions of their own experiences, is a relatively recent development, dating back to the mid-twentieth century (Edwards & Holland, 2023). Interviewing can be seen as an interactive communication process between two parties, wherein at least one party

possesses a predetermined and substantive objective, typically encompassing the posing and addressing of inquiries (Stewart & Cash, 2017). Interviews enable the in-depth acquisition of responses about human experiences, perceptions, ideas, emotions, and knowledge (Patton, 2002).

There are generally two types of interviewing in qualitive research: Semi-structured and unstructured (Stewart & Cash, 2017). In the semi-structured interview, which serves as the focal point of the current study, the researcher maintains a predetermined list of questions to be addressed during the interview. Additionally, the interviewer, with the flexibility to delve deeper into responses, facilitates a dialogue aimed at obtaining all-inclusive and in-depth responses. The probing question serves the purpose of eliciting further information from the interviewee (Edenborough, 2002). Probing questions can be either open-ended or closed-ended in nature. Examples of open-ended probing questions include prompts like "Tell me about that," or questions beginning with "How" or "Why." On the other hand, closed probes tend to be more direct, such as, "Were you selling to the personnel function or to the line?" It's worth noting that excessive probing can sometimes make individuals feel as though they are being interrogated, leading to discomfort. This sentiment is echoed in the perception of questions or responses designed to challenge the interviewee, such as statements like "I disagree with that," or questions like "Why do you hold that view?" In this study, probing questions were employed to elicit participants' understandings at a codable depth.

Yet not all interviews proceed faultlessly. In an interview, respondents may offer unimportant or irrelevant details, while simultaneously choosing to withhold important information they deem irrelevant, obvious, sensitive, or potentially risky (Stewart & Cash, 2017). To ensure the conversation remains focused and under control, the interviewer intervenes tactfully when necessary and guides respondents back on track (Ibid, 2017). Without such an intervention, sufficient data cannot be obtained from the participants. Therefore, the exposition of open questions alone might not be adequate to get codable responses. To the best of our knowledge, there has been no study in the literature comparing the codability aspect of open-ended questionnaires and interviews. Therefore, there seems to be a need for such a study. It is believed that this study could be important in filling this gap in literature.

Theoretical Frameworks

Qualitative Research

The philosophy of qualitative research emerged prominently in the 20th century, marking a departure from the predominant classical philosophy and mechanical worldview that prevailed among researchers before this era. In classical philosophy, the prevailing notion was that of an external world surrounding us—a singular, accessible reality existing independently of the observer (Glesne, 2013). The seventeen and eighteen-century philosophers like John Locke (Locke, 1690), George Berkeley (1685-1753), and David Hume (Hume, 1751) were proponents of this viewpoint (Chalmers, 1999), which was essentially rooted in the perspectives of Aristotle (384-322 BC) and modern paradigms such as positivism, objectivism, and empiricism. According to Aristotle, there exists a reality that is independent of human perception, and individuals interact with this reality through their five senses (hearing, sight, smell, taste, and touch). This approach posits the existence of a singular, objective world—a single

reality. In this perspective, the acquisition of knowledge follows an inductive process, beginning with observation and culminating in the identification of a generalizable linkage among objects or events (Moseley, 2008). This classical mechanical approach served as a foundation for quantitative research, where researchers aimed to uncover this singular objective reality. Through systematic observations, they identified theories and/or laws. For instance, during his visit to the Galapagos Islands, Charles R. Darwin (1809-1882) examined the variations in bird beak structures and their correlation with the surrounding physical environment. He observed how the thickness, length, or shape of birds' beaks varied in response to environmental factors, noting the intricate harmony between the physical surroundings and organic life. Building upon these observations, Darwin formulated the theory of evolution, positing that organisms with genetic advantages enabling adaptation to their environment would thrive and reproduce, while others would weaken in numbers. His research method seemed to follow a process beginning with observation and culminating in the establishment of scientific knowledge.

From the 17th to the 20th century, this philosophical perspective dominated scientific inquiry, facilitating significant advancements in science and technology (Westfall, 2008). However, the scientific community was profoundly shaken by a series of experiments conducted at the onset of the 20th century. These experiments revealed that subatomic particles, such as electrons, protons, and neutrons, exhibited wave-like behaviors when passing through two narrow slits side by side, generating interference patterns akin to those of water waves. This unexpected revelation challenged conventional understanding, as these micro-particles were anticipated to move linearly like a tiny stone. Furthermore, the act of observation itself was found to influence the behavior of particles (Tro, 2020); that is, when attempts were made to observe their passage through the slits, they behaved like particles, moving linearly as expected. Successive repetitions of the experiment yielded consistent results.

The experiments demonstrated that electrons, when ejected from the same source, did not go to a singular point upon landing. While classical science allowed for the precise prediction of the motion of objects like a stone thrown at a particular angle and speed, the behavior of electrons disobeyed such deterministic expectations. Instead, probability calculations assisted in predicting their landing positions. Consequently, it became evident that an unpredictable external world was impacted by the presence of the observer. These experiments raised doubts regarding the validity of the assumption of an objectively observable external reality independent of the observer, which was fundamental to classical philosophy. While classical scientific principles effectively explained phenomena in the macro-world, they fell short in elucidating behaviors at the micro-level, such as those of small particles at the atomic level.

According to the British philosopher Karl Popper (2004), theories or laws cannot be derived solely through inductive reasoning based on observation. To establish meaningful connections between objects or events observed, the observer must first possess knowledge of such connections (Chalmers, 1999). Concepts like heat, electrons, kinetic energy, genes, atoms, and gravity are abstract constructs of the mind—they are not directly observable in the external world and thus cannot be uncovered through mere observations. These concepts belong to the realm of ideas, synthesizing disparate components of the material world to establish meaningful relations between them. Scientists first apprehend those ideas and thereafter make observations to validate their hypotheses. For instance, Darwin was already acquainted with the concept of evolution, as evidenced by its mention in his

grandfather's book "Zoonomia: or the Laws of Organic Life." Darwin did not discover the concept of evolution solely through observations on the island; rather, he utilized this preexisting idea as a framework for his observations, seeking evidence to support his hypothesis (Lawson, 1995). Scientists' observations are invariably influenced by their existing knowledge—their perceptions are shaped by what they already know. The image below depicts some microorganisms. Which one or ones do you think belong to the Oraminex creature?

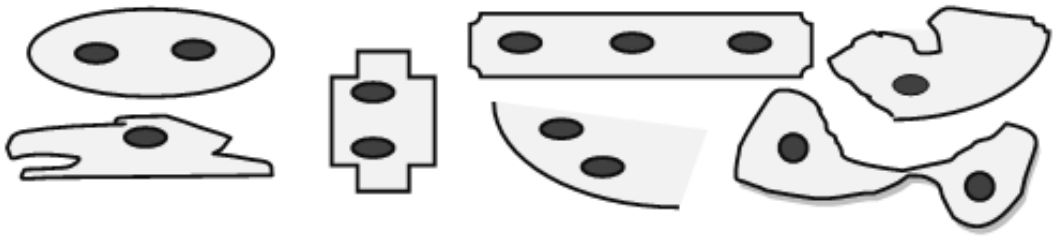

Figure 1. Oraminex Creature (Saglam, 2019, p. 13)

Observing them would be useless without an understanding of the Oraminex concept. Our observations gain meaning when grounded in conceptual frameworks. We perceive the world through the lenses of our existing concepts and understandings. Therefore, no one could ever select the fitting one or the ones without the knowledge of oraminex. Below is an X-ray film of a human lung. What do you think of the illness of this person? What is your diagnosis?

Figure 2. A Lung X-ray (Saglam, 2019, p. 13)

Without medical knowledge, making a diagnosis appears to be impossible. However, a health doctor with their knowledge will be able to identify any illness in the image within seconds, which would not be surprising. What do you see in the picture below?

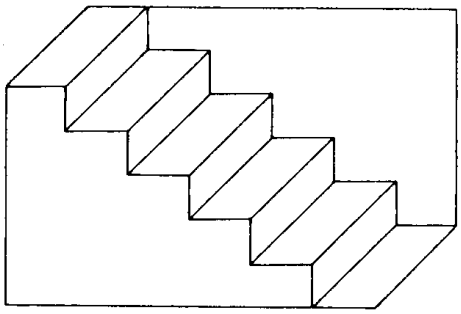

Figure 3. Staircase (Chalmers, 1999, p. 6)

Despite being depicted in two dimensions; the image appears three-dimensional to you. Further to that, while the picture itself lacks depth, you perceive depth within it. Interestingly, when this image was presented to some members of African tribes, they perceived it as two-dimensional, with none recognizing it as a staircase (Chalmers, 1999). This outcome is not unexpected, as staircases are not part of their living environments. Consequently, their lack of knowledge and experience of the staircase expectedly hindered their ability to perceive depth within the image. What do you see below?

$$(x - h)^2 + (y - k)^2 = r^2$$

For many of us, the equation may appear as no more than a series of letters and numbers. If, however, it is presented to a mathematician, they would very probably recognize it as an equation of a circle. Thus, we see and make sense of the external world not through the eyes, but through the lenses of our concepts. Perception and interpretation of the external world are determined by the observer's conceptual frameworks. As each person holds unique concepts, the external world is perceived differently by each of us. In essence, the extent of the world's existence varies according to the number of people and their perspectives. For instance, an apple tree is perceived differently depending on one's perspective. From our viewpoint, it is a highly beneficial plant that yields sweet fruit, provides essential vitamins, and releases oxygen into the atmosphere through photosynthesis. Additionally, it contributes to air purification by absorbing carbon dioxide and serves as a habitat for birds, nutrition for worms, and shade for humans. However, a farmer's perspective might differ, viewing the apple tree as one of many crops requiring care such as fertilization, thinning of its initial fruits, soil aeration, and protection from pests and diseases. Conversely, a native inhabitant of rainforests may regard the tree as a sacred component of the forest and a vital food source for themselves and their family. Further, a merchant may perceive the tree solely as a means of profit. Hence, the apple tree holds diverse meanings for different individuals, each interpreting it based on their unique perspective and needs.

In conclusion, rather than a singular reality, there exist numerous perceptions of reality, each as numerous as the individuals observing it. Our perceptions are inherently subject to change, evolving alongside our shifting concepts and understanding of the world. This perspective has resulted in the emergence of qualitative research. Qualitative researchers endeavor to explore the diverse array of perceptions by immersing themselves in participants' natural environments (Creswell, 2013). They engage in direct dialogue, attentively listen to participants' experiences and thoughts, and scrutinize relevant written, visual, or historical materials. Employing

open-ended questions, they seek to comprehend individuals' perceptions of reality with minimal influence. Subsequently, qualitative researchers meticulously organize the collected data into codes, themes, or categories, and employ visual aids such as tables and graphs to draw inferences. Ultimately, their goal is to present a detailed and comprehensive depiction of participants' individual or group perceptions.

Phenomenology and Phenomenological Interviewing

Phenomenology constitutes the foundational philosophy guiding the data collection methodology employed in this study. According to van Manen (2016), phenomenology refers to the way of accessing the world as we experience it pre-reflectively. To him, pre-reflective experience is the customary experience that we live in and that we live through for most, if not all, of our day-to-day existence. He alleged that phenomenology serves primarily as a philosophical tool for questioning rather than a means to provide definite answers, discoveries, or conclusive outcomes. The process of questioning possesses the potential for getting new insights, understandings, and cognitive or non-cognitive perceptions of existential realities. It offers insights into the significance of phenomena and events in their unique contexts.

van Manen (2016) further alleged that in our daily lives, we can engage in routine activities because they are somewhat habitual, repeatable, common, and reproducible. This is why we refer to it as a common or everyday language. Everyday language comprises words that facilitate communication of common meanings and foster interpersonal understanding. Even though these common words can be used to describe unusual or novel situations, the reproducibility of language enables us to navigate through our daily affairs. However, beneath the surface of the reproducibility of everyday thought and language lie the original thoughts and poetic imagery that enable the reproducibility of life itself. Phenomenology seeks to grasp and articulate these original meanings, while also remaining open to new original beginnings that shape the foundational aspects of phenomenological inquiry. Since the current study aimed to inquire how students interpret their lived experiences, phenomenological interviews were conducted. The purpose of such interviews is to explore students' lived experiences or meanings attributed to those experiences.

The Research Question

This study aims to perform a comparative examination of two qualitative data collection approaches: the semi-structured interview and the open-ended questionnaire, particularly focusing on codability. Therefore, in this study, the following question was the focus of concern: Which method is better for providing codable data, administering an open-ended questionnaire, or conducting a semi-structured interview?

Method

Participants and Data Collection

A total of twelve freshman college students, comprising two males and ten females, were involved in this study. Before commencing the actual study, numerous pilot studies were conducted. Following the pilot studies,

adjustments were made to the questions, including the removal of some questions, the addition of new questions, and the rephrasing of unclear questions. These modifications aimed to enhance the reliability of the collected data. After the questions took their final form, open-ended questions were administered to all first-year students in a classroom setting at school, face to face. Students were instructed that: this was not an exam, the answers would not be converted into any academic scores, they should provide the best possible answer, they ought to elaborate on their answers, and briefly write "I don't know" for those they did not know the answer to. Following this phase, individual interviews were conducted with volunteer students. The interviewer possesses 19 years of experience in conducting interviews and instructing on qualitative data collection at both undergraduate and graduate levels. Hence, he could be regarded as a professional in the field. Although the interviews started approximately one week later, there were variations in the time intervals between the administration of the open-ended questions and the interviews, ranging from one week to months. Such discrepancies in timing may have allowed for potential cognitive changes in students as they may have acquired new information related to the study during these long periods. Nevertheless, it is noteworthy that these variations did not compromise the reliability of the collected data. This is attributed to the fact that the focus was on analyzing the students' responses to figure out whether they were codable or not rather than monitoring their conceptual change over time. Throughout the interviews, the interviewer was granted autonomy to pose probing questions in addition to the open-ended questions, to elucidate the students' intended meanings. Below are the structured or open-ended questions that we sought an answer to.

Open Questions

The following questions were used verbatim both in interviews and in open-ended questionnaires. However, the interviewer further possessed the freedom to probe participants' responses.

a. How would you explain the acceleration of a vehicle traveling at a constant speed? What do you think is the cause of this acceleration?
b. When a certain amount of water is spilled onto a table, after a while, we observe that the spilled area dries up, and the water disappears. What is the reason for this?
c. How do living cells produce their energy?

Results

The students' responses to open-ended questionnaire and interview questions were inductively coded (Patton, 2002; Saglam & Kanandli, 2024) separately to discover patterns in the data. Two codes were allocated to these responses: "codable" and "non-codable." Codable responses encompass complete answers that enable the researcher to assign a code, irrespective of whether they constitute accurate explanations or misconceptions. Conversely, responses requiring additional inquiry or elaboration, preventing the researcher from assigning a code, were deemed non-codable. To illustrate, when being asked, 'How would you explain the acceleration of a vehicle traveling at a constant speed? What do you think is the cause of this acceleration?' student 1 responded, 'The phenomenon that affects acceleration is the application of force to the vehicle in the direction of its motion, which increases the vehicle's speed'. At first glance, this response may seem to be proper or adequate. However,

it requires a probing question to clarify what this force is or could be. Therefore, this response is deemed non-codable. Yet, let us see a codable response and focus on the interview of student 11 below. In the dialogue, the letter "*S*" represents the student, while the letter "*I*" represents the interviewer.

I: How would you explain the acceleration of a vehicle traveling at a constant speed? What do you think is the cause of this acceleration?

S: A force. An effect. With a forward-moving effect.

I: What kind of force or effect is this?

S: If a force is applied forward, the vehicle accelerates.

I: Why might this vehicle have accelerated?

S: Force.

I: What could this force be?

S: It has accelerated due to pushing force. Just like when you press the gas pedal, the car moves forward.

Initially, the student's response (*A force. An effect. With a forward-moving effect*) was not codable. Accordingly, the interviewer, being aware of this fact, attempted to elicit the student's understanding of what they meant by "force or effect". Through several probing questions, the interviewer eventually received a codable response, *Just like when you press the gas pedal, the car moves forward.* The interviewer figured out that the cause of the force, according to the student, was the gas pedal. Therefore, he stopped asking further questions. To measure the reliability of the emergent codes, the data were analyzed three times at different time points, and the consistency between the codes was found to be approximately 98%. According to Miles and Huberman (1994), this percentage indicates a high level of reliability of codes.

The analysis of student responses indicated that the answers were found codable in all interviews with no exceptions. On the other hand, those given by the students to open-ended questions did not follow this pattern. They varied. While some of the answers were codable, some were not. As Figure 4 depicts emergent codes for open-ended questions, Table 1 illustrates the codes that emerged from the open-ended questionnaire and interview.

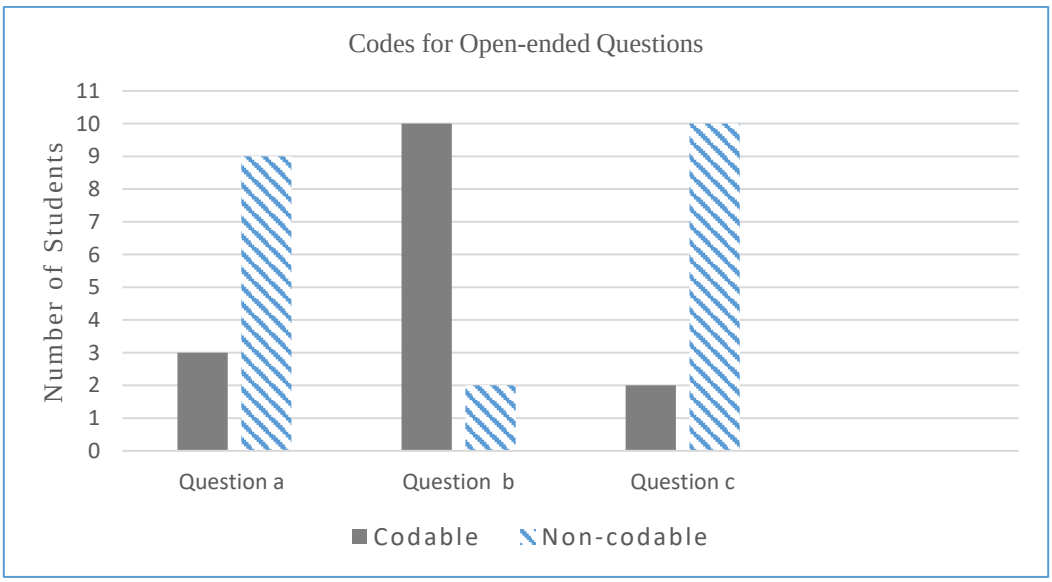

Figure 4. Codable and Non-codable Responses for Questions a, b, and c

Table 1. Codes for Students' Responses

	Categories					
	1. Responses to Open-ended Questions			2. Responses to Interview Questions		
Student 1, male	a. Non-codable	b. Non-codable	c. Codable	a. Codable	b. Codable	c. Codable
Student 2, female	a. Codable	b. Codable	c. Non-codable	a. Codable	b. Codable	c. Codable
Student 3, female	a. Non-codable	b. Codable	c. Non-codable	a. Codable	b. Codable	c. Codable
Student 4, male	a. Non-codable	b. Codable	c. Codable	a. Codable	b. Codable	c. Codable
Student 5, female	a. Codable	b. Codable	c. Non-codable	a. Codable	b. Codable	c. Codable
Student 6, female	a. Non-codable	b. Codable	c. Non-codable	a. Codable	b. Codable	c. Codable
Student 7, female	a. Non-codable	b. Codable	c. Non-codable	a. Codable	b. Codable	c. Codable
Student 8, female	a. Non-codable	b. Codable	c. Non-codable	a. Codable	b. Codable	c. Codable
Student 9, female	a. Non-codable	b. Non-codable	c. Non-codable	a. Codable	b. Codable	c. Codable
Student 10, female	a. Codable	b. Codable	c. Non-codable	a. Codable	b. Codable	c. Codable
Student 11, female	a. Non-codable	b. Codable	c. Non-codable	a. Codable	b. Codable	c. Codable
Student 12, female	a. Non-codable	b. Codable	c. Non-codable	a. Codable	b. Codable	c. Not asked

According to Figure 4, for question a, three students provided a codable response while nine students provided a non-codable response. For question b, ten students provided a codable response while two students provided a non-codable response. For question c, two students provided a codable response while ten students provided a non-codable response. In other words, the responses provided by students for questions a and c could be coded only 25% and 17%, respectively, while for question b, this rate was 83%. When considering all the answers, approximately 42% of the responses could be coded. Based on this result, it can be concluded that the data obtained through interviews have a higher level of codability compared to those of open-ended questions. Additionally, not all responses to open-ended questions (a, b, and c) were fully codable. The codability level varied across different questions, with low codability observed for responses to questions a and c, while the opposite was true for question b. Therefore, it can be concluded that codability may vary depending on the nature of the open-ended question.

To assess the significance of the association between categories (Open-ended vs. Interview) and codes (Codable vs. Non-codable), a chi-square test is run (see Table 2).

Table 2. Contingency Table for Chi-Square Analysis of Categories and Codes for Each Response

		Codable	Non-codable	Chi-Square (df=1)	Sig.(*)
Question-a	Open-ended	3	9	14.400	.000
	Interview	12	0		
Question-b	Open-ended	10	2	2.182	.478
	Interview	12	0		
Question-c	Open-ended	2	10	13.594	.001
	Interview	11	1		

Chi-square analyses were separately conducted for questions a, b, and c, unveiling distinct patterns. Questions a and c demonstrated a meaningful association between response type (open-ended vs. interview) and codability, with non-codable responses prevailing in open-ended questions and codable responses being more prevalent in interviews. Conversely, question b did not exhibit such an association between response type and codability. To further evaluate the significance of the overall association between categories and codes, a second chi-square test was conducted (see Table 3).

Table 3. Contingency Table for Chi-Square Analysis of Categories and Codes

	Codable	Non-codable	Chi-Square (df=1)	Sig.(*)
Open-ended	15	21	26.182	.000**
Interview	35	1		

The null hypothesis is that there is no association between the categories and the codes, while the alternative hypothesis is that there is an association between them. Since the p-value is less than the significance level of 0.01, the null hypothesis is rejected. Therefore, there is a statistically significant association between categories and codes. In other words, the codable responses are significantly associated with the interview.

Conclusion

The findings suggest that interviewing proves to be a more effective tool as a qualitative data collection method than responding to an open-ended questionnaire. It was observed that while all data obtained through interviews could be coded, only 42% of the data gathered through the open-ended questionnaire was codable**.** The chi-square analysis of the data further indicated this difference is statistically significant. That is, codable responses are significantly associated with the interview. The reasons for this notable linkage could be attributed to the follow-up questions posed during the interviews.

The power of probing seems to make interviewing a superior data collection tool. While responding to open-ended questions, participants provide their answers with varying depth and breadth. Their lack of awareness regarding the quality of their responses often results in unclear or/and incomplete explanations. Participants might furnish extraneous or inconsequential details, while on the other hand, they might refrain from disclosing pertinent information they perceive as trivial, sensitive, or potentially perilous (Stewart & Cash, 2017). Therefore, it is wise to guide participants effectively and exert control over a conversation by tactfully intervening to redirect when necessary.

A seasoned interviewer maintains attentiveness throughout the interview, promptly identifying any deficiencies or ambiguities in the responses provided. This heightened awareness enables them to conduct real-time analysis of the responses and to pose probing questions as required. As a result, the interviewer successfully acquires codable (clear and complete) data. In contrast, in the case of open-ended questions, there is no oversight or monitoring of responses. The participants arbitrarily generate their responses. Consequently, this scenario leads to the occurrence of both codable and non-codable data due to chance.

Another factor contributing to the interviews' effectiveness in handling open-ended questions may be the interviewer's experience and expertise in the field. In this study, the interviewer's proficiency probably enhanced the codability of the interviews. Achieving such a high level of codability in research conducted by inexperienced interviewers can pose a challenge. The proficiency of experienced interviewers in obtaining codable data lies in their ability to pose precise questions at opportune moments. They promptly address any potential misunderstandings, utilizing probing questions to reveal the participant's true comprehension. Additionally, when participant explanations are deemed inadequate, a professional interviewer asks for clarification as a further inquiry.

Furthermore, it is crucial to consider the inherent characteristics of open-ended questions (Edenborough, 2002). For instance, inquiries such as "What is your age?", "What is your preferred pet?", or "What is your favorite color?" lend themselves easily to encoding since they are not open to interpretation. However, responses to questions that are open to interpretation may not be as easily encoded. To illustrate, questions like "What is the reason for your preference for pets?" may elicit responses that require extensive elaboration or clarification due to their interpretive nature. In such cases, interviews appear to be a more suitable tool for data collection as demonstrated in this study.

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