

Data Analysis

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Steps in a Research Study

1. Develop research questions
2. Create an instrument to directly answer research questions
3. Collect data following standardized research methods
4. Analyse data according to the research questions

Characteristics of Good Research Questions

- Relevant
- Original
- Interesting
- Clear
- Focused on one key phenomenon
- Allows for complex analysis
- Allows for both positive and negative results
- Manageable in terms of time, resources, and research skills
- Typically begin with *What, How, or Why*

Bad Research Questions

- What are the harmful effects of speaking in tongues?
 - **Better:** What do Christians believe are the outcomes of speaking in tongues?
- What are the effects of participating in youth group?
 - **Better:** What are youths' opinions about the value of participating in their church's youth group?
- What are the effects of instructional materials?
 - **Better:** How frequently do teachers use specific types of instructional materials in their lessons?

Developing an Instrument

- The instrument is developed directly from the Research Questions
- For each Research Question, ask:
 - What is the key *variable* (phenomenon) that I am trying to get information about?
 - If there is no clear answer, it is a bad research question.
 - Who can give me the most accurate information about the variable?
 - How can I most directly get information about the question?
 - *Avoid asking peoples' **beliefs** about the question*

Developing an Instrument

- **Self-Report:** Participants are asked to report on their own demographic characteristics (biodata), attitudes, beliefs, knowledge, feelings, and behavior.
 - Self-report can be either a questionnaire or interview
 - Participants generally **cannot** report on the attitudes, beliefs, knowledge, and feelings of **others**.
 - Participants generally **cannot** report on phenomenon that they are not directly experiencing

Common Misconceptions in Instrument Development

- Asking church leaders about the experiences of people living with HIV/AIDS, inner-city youth, children, women, Muslims, etc.
- Asking church members about specific aspects of a church ministry (e.g., asking ordinary church members about the social ministries offered by a church)
- ***Giving an instrument to the wrong group of people leads to bad conclusions***

Types of Instruments

- **Face-to-Face Interview:** Gathers rich, in-depth, clear information
 - More complex to analyse
 - Since it takes more time, fewer people can participate
- **Questionnaire:** Gathers surface information from a larger sample
 - Participants must be well-educated

Additional Types of Instruments

- **Focus Group:** Unstructured discussions among a small group of participants
 - Each person shares their experiences and perspectives while brainstorming off the ideas of others
 - Good for identifying original solutions to problems
- **Observation:** Researchers observe the behavior of others or specific situations
- **Archival Records:** Existing information such as church bulletins, written sermons, etc.
- **Examinations:** Best when interested in participants' knowledge of a topic

Translating Items from Research Questions to Interview Questions

- Research Questions are abstract and general:
 - RQ: How many pages do students read each week?
 - RQ: What are ECWA pastors' beliefs about the role of forgiveness in the violence in the North?
- Interview Questions are asked directly to participants (using "YOU"):
 - IQ: How many pages do you read each week? a) 0-10 b) 11-20 c) 21-30 d) 31-40 e) 41-50 f) 50 or more
 - IQ: What do you believe is the role of forgiveness in the violence in the violence in the North?

Translating Items from Research Questions to Interview Questions

- RQ: How many hours do parents spend engaged in church activities each week compared to how many hours they spend with their children?
 - IQ: How many hours do you spend in church activities each week? A) 0-1 hour B) 2-3 hours C) 4-5 hours D) 6-7 hours e) 8-9 hours f) 10 or more hours
 - IQ: How many hours do you spend purposely interacting with your children each week? A) 0-1 hour B) 2-3 hours C) 4-5 hours D) 6-7 hours e) 8-9 hours f) 10 or more hours
- RQ: How do ECWA members pray for their enemies?
 - IQ: Do you ever pray about your enemies? <Pause. If yes,> How do you pray for your enemies?

Translating Items from Research Questions to Interview Questions

- RQ: Which topics do ECWA pastors preach about most frequently?
 - IQ: What topics do you preach about most frequently?
 - IQ: What have been your sermon topics every week for the past two months?
 - IQ: What Bible passages have you preached on in the past two months?

Translating Items from Research Questions to Interview Questions

- RQ: How many ECWA church members are suffering from psychological trauma?
 - IQ: Administer the UCLA PTSD Reaction Index that measures psychological trauma
 - How often have you experienced the following in the past month? 0=None, 1=Little, 2=Some, 3=Much, 4=Most
 - I have dreams about what happened or other bad dreams.
 - I watch out for danger or things that I am afraid of.

Avoid Items that Assess Belief about the Research Question

- RQ: Which topics do ECWA pastors preach about most frequently?
 - Bad IQ: Which topics do ECWA pastors preach about most frequently?
- RQ: How many hours do parents spend engaged in church activities each week compared to how many hours they spend with their children?
 - Bad IQ: Do parents spend more time in church activities or with their children each week?

Avoid Items that Assess Belief about the Research Question

- RQ: How many ECWA church members are suffering from psychological trauma?
 - Bad IQ: How many ECWA church members are suffering from psychological trauma?
- RQ: How many pages do students read each week?
 - Bad IQ: How many pages do students read each week?

Avoid Items that Assess Belief about the Research Question

- RQ: What are pastors' beliefs about the role of forgiveness in the violence in the North?
 - Bad IQ: What are pastors' beliefs about the role of forgiveness in the violence in the North?
- RQ: How do ECWA members pray for their enemies?
 - Bad IQ: How do your church members pray for their enemies?

Content of an Instrument

- An instrument should only contain two types of items:
 - Items that directly answer the research questions
 - Personal information items to help readers understand the participants
 - Always: Gender, Age
 - Potential: Marital Status, Denomination, Position in the church, Length of time in ministry, Educational status, etc.

Open-Ended Sample Item

- Research Question: Which topics do ECWA pastors preach about most frequently?
- *What topics have you preached about in the past two months?*
 - *Answer: Holy Spirit.*
 - In an interview, the researcher could follow-up with, “What do you mean?”
 - With a questionnaire, the researcher will have to make a guess or discard the response.

Close-Ended Item

- *What topics have you preached the most about in the past two months? (Please circle up to two.)*
 - a) Evangelism
 - b) Persevering in the faith
 - c) Living out the faith
 - d) Instruction in church doctrine
 - e) Biblical character virtues
 - f) Character of God

Importance of a Good Questionnaire

- Conclusions in a study are only as good as the data that is collected.
- Data that is collected is only as good as the questionnaire that collects the data.
- A poorly designed questionnaire leads to bad data, which leads to bad conclusions.
- **Developing a good questionnaire is a key part of conducting a high quality study.**
- **Developing a good questionnaire takes a lot of time, thought, and preparation.**

Guidelines in Developing an Instrument

- Write a draft
- Revise the draft
 - Read the draft from the perspective of the participant.
 - Give the draft to somebody who is unfamiliar with your study to provide feedback
- Pilot the draft
 - Distribute to a small group of people similar to your target population to complete
- Revise the draft, Revise the draft, Revise the draft.

Steps in Data Analysis

1. Analyse personal information to describe your study
2. Analyse each research question separately

Types of Variables

- **Discrete Variables:** Variables with distinct categories
- **Continuous Variables:** Variables that can be expressed numerically along a continuum

Identify Discrete and Continuous Variables

1. Gender
2. Age
3. Denomination
4. Income
5. Has a person been baptized?
6. Attendance at various church functions
7. Marital Status
8. Educational Qualifications
9. How many times a person reads their Bible each week
10. Achievement in CRK
11. Has a person been to a pastor for counseling before?
12. How frequently a person prays each week
13. Church offering

Frequency and Percent

- **Frequency:** Tally the number of people in each category
 - Use when all responses are in a discrete category
- **Percentage**
 - Step 1: Frequency in a category divided by the total number
 - Step 2: Multiply by 100%

Calculating Percent

Denom.	Freq.	Divided by total	Times 100%	2 decimal points
ECWA	37	0.486842	48.68421%	48.68%
Baptist	22	0.289474	28.94737%	28.95%
COCIN	15	0.197368	19.73684%	19.74%
Pentecostal	2	0.026316	2.631579%	2.63%
Total	76	1.00000	100.000%	100.00%

Reporting Percent

Denomination	Frequency	Percentage
ECWA	37	48.68%
Baptist	22	28.95%
COCIN	15	19.74%
Pentecostal	2	2.63%
Total	37	100.00%

“The largest denomination represented in the sample was ECWA, with almost half of the participants.”

Calculating Percent

Area of Specialization	Freq.	Divided by total	Times 100%	2 decimal points
Total				

Mean

- **Mean:** Arithmetical center of data
 - Use with continuous data
- Calculating the mean
 - Step 1: Sum all of the scores
 - Step 2: Divide by N (sample size)

Years Experience as a Pastor

10	7	24	1	2	8	2	3	5	8
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- Step 1: $10+7+24+1+2+8+2+3+5+8 = 70$
- Step 2: 70 divided by 10 (N) = 7
 - **Mean = 7**
- “The average (mean) years of experience as a pastor was 7 years.”

Calculate Mean of Attendance at Bible Study for 10 weeks

14	14	11	12	12	11	13	13	12	12
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Appropriate Statistics

- **Discrete Variables:** Frequency and percentage
 - Percentage is easier to interpret because it means “If there were 100 cases EXACTLY, this many would fit in this category.”
 - The most frequent response is generally reported
 - When developing a Table, it is often easiest to interpret by sorting the categories from highest to lowest
- **Continuous Variables:** Mean
 - Also report the range (i.e., highest and lowest scores) of the sample
- **Comparisons:** Inferential Statistics

Missing Data:

Incomplete Items or Entire Questionnaires

- Missing data on questionnaires is expected
 - It is UNETHICAL to make up a response or guess
 - There are scientifically agreed-upon ways of handling missing data
 - Easiest is to discard the item for that participant.
 - If multiple responses were ticked, then it is counted as missing data and the item is discarded
 - If too many items are missing on one questionnaire (e.g., half), then the entire questionnaire can be discarded
 - Report the number of discarded questionnaires

Making Comparisons:

Scores on WAEC

Note: Scores were generated by a random number table.

	Gov't	Private
English	24.13	28.18
Maths	58.90	27.87
Integrated Science	61.19	47.89
Chemistry	34.38	34.25
Social Studies	99.10	86.97
CRK/IRK	70.90	70.53

How do we know when the differences between government and private schools are large enough to be meaningful, or significant?

Very Brief Overview of Inferential Statistics

- There will always be differences between groups in a research study
- Inferential statistics determine whether the difference between the two groups in the sample is large enough to be able to say that the findings are *significant*, meaning that the results are valid for the entire population
- If the difference between the groups is very small, then the findings are *not significant* and therefore were simply the result of chance
- Comparisons generally cannot be made without inferential statistics (generally a t-test) that determines whether the comparison is significant or not

Analysing Open-Ended Items

1. Identify **themes** in the responses
 - **Theme:** Concept that is frequently repeated in the data
2. Develop a detailed description of each theme
3. **Code** all responses to find themes
 - **Code:** Demarcate every statement that fits the theme
4. Calculate the frequency that each theme is mentioned in the items
5. Key interesting statements can be reported verbatim in the results

Analysing Open-Ended Items

RQ: What do teachers believe are the disadvantages of beating in the classroom?

Code	Theme	Description
S	Stubbornness	Hardens the student and/or student continues to misbehave
I	Injury	Beating could injure the student
F	Fear	Student begins to fear the teacher, school, and/or the class
NM	Negative Mood	The student is put into a negative mood and/or cannot focus
OD	Other Disadvantage	A disadvantage that does not fit in another category
NL	Not Learn	Student not learn what they are being beaten for

- Disadvantages, when a teacher goes to that extreme of beating a child without finding out what he did, and the child will not accept his fault, he may not know what he has done that is wrong, he will just feel that this person is beating me just like that.
- Good. Disadvantages. Yeah. I think they outweigh the advantage. One, it creates fear. Creates fear. And then where there is fear, there is no learning. The child's attention is on what harm the beating makes. They may even feel that whatever it does, the beating, so the fear is there constantly throughout the class that you are there talking. He is looking at you but he is not listening.
- The disadvantages is that it is not every offense that use cane and out of annoyance if you are not careful, you can hurt the child so it's why I don't like using cane.

Table 3. Teachers Beliefs of the Disadvantages of Beating.

Theme	Description	Percent
Stubbornness	Hardens the student and/or student continues to misbehave	50%
Injury	Beating could injure the student	40%
Fear	Student begins to fear the teacher, school, and/or the class	35%
Negative Mood	The student is put into a negative mood and/or cannot focus	25%
Other Disadvantage	A disadvantage that does not fit in another category	20%
Not Learn	Student not learn what they are being beaten for	10%

Reporting Data Analysis

- Re-state the research question
- Explain the data that was used to answer the research question (i.e., item on the instrument)
- Present the statistics, typically in a table or figure
- EXPLAIN ***key findings*** from the statistics
 - Do NOT repeat every single statistic from the table
 - DO highlight interesting points found in the data

Example Data Analysis Report

The first research question asked in what type of situations do students find examination malpractice to be justifiable. This research question was answered by calculating the percent of students who indicated they might engage in exam malpractice in that situation for each of the twenty exam malpractice situations presented on the questionnaire. Table 1 presents the results of this research question.

Rank Order	Situation	Percent ^a
1	The student lost a family member just before the exam.	80%
2	The student was sick throughout the term.	75%
3	The student is a close friend of yours.	73%
4	The lecturer never showed for class.	60%
5	Student studied but is dull so did not understand the lesson.	67%
6	Questions on the exam were not covered in lecture or book.	60%
7	Student could not afford the textbook and other materials.	66%
8	The lecturer did not care about the students.	62%
9	The lecturer was a poor instructor.	61%
10	A strike interrupted the term.	52%
17	The invigilators are being watchful.	20%
18	The student has never been seen before.	22%
19	The student never attended class because of laziness.	7%
20	The student partied throughout the term so they never studied.	6%

^aPercent of students who indicated they might engage in exam malpractice in that situation

From Table 1, it can be seen that four of the top five situations that students use to justify examination malpractice are situations based on the characteristics of the peer needing the assistance: the student lost a relative, the student was sick, the student was a close friend, and the student studied hard but is dull. Likewise, the two situations with the lowest justifiability factor were also related to the student needing the assistance: participants were unwilling to engage in examination malpractice if the peer asking for assistance was lazy or if the peer partied throughout the term. Therefore, students justify cheating most based on the characteristics of the peer asking for assistance.

Instructor characteristics were both used to justify examination malpractices as well as deter students from engaging in malpractices. Positive instructor characteristics such as providing support to help the students learn, covering the material well, and being vigilant during the examinations were a strong deterrent for students justifying examination malpractice: 80% of the students reported they would not provide an answer during an exam if the invigilators were being watchful. Similarly, 70% of the students said they would not provide assistance to their peer if the instructor covered the material well.

Table 2. Factors that Influence Students' Choice into Education

Rank Order	Factor	Mean
1	Shape future of children	6.09
2	Make social contribution	6.06
3	Prior teaching experiences	5.49
4	Work with children	5.35
5	Enhance social equality	5.03
6	Time for family	4.74
7	Teaching ability	4.71
8	Job security	4.62
9	Intrinsic career value	4.54
10	Fallback career	3.39
11	Social influences	3.10
12	Exploitation	2.92

Table 5. Christian Response to Violence in Northern Nigeria.

	Northern Pentecostal	Northern Mainline	South Pentecostal	Overall
Prayer	64%	70%	81%	72%
Dialogue	28%	24%	19%	23%
Love	17%	36%	9%	21%
Government	22%	12%	26%	19%
Evangelism	17%	12%	13%	13%
Christian Living	11%	22%	4%	13%
Watch	6%	26%	2%	12%
Forgive	3%	16%	2%	7%
Security Conscious	3%	10%	2%	5%
Violence	8%	2%	4%	4%
Involved in Peace	11%	0%	0%	3%

Taken from: McCain, D., Gaiya, M., & Korb, K. (2014). Salt and light or salt and pepper...*Pneuma*.

On the other hand, a significantly higher percentage of northern Pentecostals than northern Mainliners reported the following two themes: involved in peace (Pentecostal CI=.04-.25) and violence (CI .03-.22). Eleven percent of northern Pentecostals reported that Christians should become actively involved in peace efforts, while no Mainliner suggested similar. For example, one Pentecostal said, "Be positively involved in reconciliation." Responses coded as violence included, "Fight back with spiritual and physical weapons," "To have peace they must prepare for war," and simply "War" and "Kill them."

Key Resources

- *The Research Methods Knowledge Base*
– <http://www.socialresearchmethods.net/kb/>
- *Conducting Educational Research*
– <http://www.korbedpsych.com/R00Steps.html>
- *VassarStats: Website for statistical computation*
– <http://vassarstats.net/>