

QUANTITATIVE RESEARCH

BASIC RESEARCH CONCEPTS

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1. THE RESEARCH PROBLEM

- is the focus of the research; a problem that a researcher wants to investigate, stated as **research questions**

E.g.

1. *How can we predict which students might have trouble learning certain kinds of subject matter?*
= correlation research
 2. *How can a headmaster improve a school morale?* = interview research
- i.e. info can be collected, must have empirical or observable referents

Good research questions must be:

- **Feasible** (time, energy, money)

E.g. *How do the students at XY School feel about the new guidance programme recently instituted in the di3strict?*

- Not so feasible: *What would be the effect on the achievement of giving each student his microcomputer for a semester?*

- **Clear** (what exactly is being investigated and what the key words mean; not too broad)

- **Significant** (worth investigating);
e.g. *How might answers to this question advance knowledge in my field / improve educational practice / improve the human condition?*
- **Ethical** (causing no harm, damage)

Three Types of Research Problems

1. **Descriptive problems** = answer the question: *What is it like?*, they find and describe a situation, state or existence of a phenomenon. The methods used:
 - *observation*
 - *scaling*
 - *questionnaire*
 - *interview*

E.g.

1. *What is a proportion of an English teacher teaching activities?*
2. *What does a typical traditional English lesson look like?*

A descriptive problem can also be **evaluative**
(e.g. *learners learning results, effectiveness of a new English coursebook, material conditions of school*)

2. Relational research problems frequently suggest a relationship of some sort to be investigated, i.e. two qualities / characteristics are tied together or connected in some way.

E.g.

What is the dependence between the university entrance test result and the successfulness of the study at the university?

BUT: they do not explain which of the phenomena (A or B) causes the relation.
(Is it A which causes B or vice versa?)

3. Casuistic research problems

= find / identify them, e.g.

- *What is the influence of using communicative language games upon English learners' effective filter?*
- *Is a non-directive educational style more effective for creating positive learners' attitude to teacher than a directive style?*

They use experimental method, compare two/more groups of research subjects which differ in one of the phenomena and statistics (Student t-test.)

In any research topic, the 3 types of the RP can be formulated:

Descriptive: *What kinds of praise do teachers use?*

Relational: *What is the relation between the kinds of teacher's praise and learners' performance?*

Casuistic: *What is the effectiveness of a postponed praise on the learners' performance in the comparison with an immediate one?*

Note: descriptive methods cannot have Hypotheses.

2. VARIABLES

- **VARIABLE** is a concept – a noun that stands for variation within a category of objects (*e.g. chair, gender, eye colour, achievement, motivation, running speed*)
- They differ, vary – to qualify the category as a variable. If all research subjects are identical – no variable! They are called ***constants***

E.g. Effects of reinforcement on student achievement: 3 groups of 3 ninth-graders, 1 student gets verbal praise, 1 gets money, 1 gets extra points

“reinforcement” is a **variable** - has 3 variations, while the grade level of the students (all are ninth-graders) is a **constant**

Quantitative vs categorical variables

- **Quantitative variables** exist in some degree along a continuum from „less“ to „more“.
 - We can assign numbers to different individuals/objects to indicate how much of the variable they possess (e.g. height);
 - how much interest they have in a subject (5 – indicating very much, 4 much, 3 some, 2 little, 1 very little interest)

- They can often be subdivided into smaller and smaller units (e.g. „length“ – can be measured in miles, yards, feet...)
- **Categorical Variables** do not vary in degree, amount, or quantity BUT are qualitatively different (eye colour, gender, religious preference, occupation preference, research methods). Cannot be quantified. Have only two values.

E.g. We wish to compare computerized and noncomputerized classrooms, the variable involved would be the presence or absence of computers.

Here are several variables:

1. Type of automobile owned (categ.)
2. Learning ability (quantit.)
3. Ethnicity (categ.)
4. Cohesiveness (quantit.)
5. Heartbeat rate (quantit.)
6. Gender (categ.)

INDEPENDENT VERSUS DEPENDENT VARIABLES

- One V can cause a change of another V.

A teacher's teaching style can lead to certain learner's learning result or performance.

- **Independent variable**: is the cause of the change. It is presumed to have an effect on another variable. Not all are possible to be manipulated. It is possible to investigate more than one independent variable in a study.

- The variable that the independent variable is presumed to effect is called *dependent variable*. It changes in the dependence on the independent variable.

The relationship between IV and DV: IV effects DV

Independent variable(s)

(presumed or possible cause)

Dependent variable(s)

(presumed results)

- The result of learners is DV, teaching style is IV.
- IV (categorical) is *the number of teachers*, the DV is *the amount of science teachers*.
- To investigate a variable, it must be operationally defined. **Operation definition** puts a variable into observable, findable, measurable connections. It determines operations which take place while measuring them.
- E.g. Variable: FLL ability, OD: score of a learner in an aptitude test

3. HYPOTHESES

- It is a prediction of some sort regarding the possible outcomes of a study.

E.g. Research question:

Will the students who are taught English by a teacher of the same gender like the subject more than students taught by a teacher of a different gender?

Hypothesis:

Students taught English by a teacher of the same gender will like the subject more than students taught English by a teacher of the same gender.

„Liking for“ E is DV, „gender of teacher“ is IV.

Extraneous variables might be: personality and ability of teacher, student, materials used, style of teaching...

Formulating Hypotheses

Main characteristics: they express relations between **two** variables!

Bad !: *Good teachers use humour in the class.*

Good: *Teachers who use humour in the class reach better education results **than** teachers who do not use it.*

In hypotheses, there are between variables expressed **differences, relations, or consequences.**

Differences: „more“; „more often“; „higher“; „different“.

E.g. Second-graders prefer school more than fifth-graders.

Relations: positive relation, negative relation, correlation.

E.g. There is a positive relation between parents' education and the intelligence of the child.

Consequences: „if – then“; „the more - the...“

E.g. If teacher increases the number of praises, then learners will learn more.

- The formulation of the H signifies the way how it will be **proved** or **rejected**.

The H with differences uses statistical research methods so that to find significant differences. E.g. Student t-test -in the case of the differences expressed in averages (average grade, average performance/achievement) or CHI-quadrante – if there are the data expressed in frequencies (frequency of teacher questions or of student absences in a period of time)

GOLDEN RULES OF A HYPOTHESIS

1. H is a statement. It is not expressed in a question. At the end of the research we must accept it if true, or reject it if not true.
2. H expresses a relation between two variables.
3. H must be testable (empirically investigated). Its variables must be measurable or expressed in categories

4. QUANTITATIVE RESEARCH METHODS

Most frequent are:

- Observation
- **Scaling**
- **Questionnaire**
- Interview
- Content text analysis
- Experiment

Each research must be:

1. VALID – its research instrument investigates what it is supposed to (*content validity*: presence of all the needed elements + *construction validity*: abstract concepts, e.g. knowledge, ability, intelligence: *Does this research instrument investigate academic literacy or literacy needed for life?*)
2. RELIABLE- means accuracy and reliability at the same time (can be reached by the repetition of measurements)

4.1 SCALING

- **Evaluative scale** is an instrument enabling to find qualities, frequency, or intensity. Researcher expresses own evaluation by marking the position on the scale.
- **TYPES OF SCALES**
 1. Ordinal scales determine order of importance, favour, occurrence

Pros: easy to create, respond;

Cons: do not show the difference between the order.

2. Interval / Frequency scales – there are equal values = distances between them. Usually, they have 3,5,7 degrees. They have an odd number. They can also measure intensity, proximity. Except numerical scales there are a number of graphic scales. E.g.

In this class I feel

useful 7 6 5 4 3 2 1 useless

Cons: respondent can overvalue or undervalue the observed features

3. Bipolar scales – are created by contradicting features

Respect the following rules:

1. Use the same part of speech (mostly only nouns, only adjectives on the both ends).
(*expert 1 2 3 4 5 DK layman*)
2. The second expression in the scale should not be a negative form of the first one.
(good ex.: *polite 1 2 3 4 5 rude*)
3. The same expression cannot be used in the scale twice.
4. The opposite expressions must be chosen very carefully.

Problems with “quasi-interval” scales:

- in lexical descriptions, the intervals can be unequal.

E.g.

I like to play

always – very often – often – sometimes – never

the intervals between *always* and *very often*
and between *very often* and *often* is not clear.

A typical scale has the following five frequency stages:

always - very often - often - rarely – never

- **Scales Data Processing**

When more respondents involved, their evaluations of each scale are scored and then expressed in percentages.

Example

A	B	C	D	E
Fully agree	agree	I do not have a categorical opinion	disagree	strongly disagree

A B C D E

*Ts should respect
s's needs.* 71% 28% 1% 0% 0%

*Ts should act
first of all like humans
and only then like
teachers.* 16% 44% 25% 12% 3%

Sum total in one line presents 100%.

More instruments with more scales have a higher reliability.

4.2 QUESTIONNAIRE

- **Basic concepts:**

Respondent: a person who fills the Q.

Questions: individual elements of the Q.

Item: the question in the form of a statement.

Administration: distribution of the Q.

The objective of the Q must be clear, concrete, well expressed.

Thought over in its content, form, structure and graphic form.

Structure of questionnaire

- Q usually has three parts:

1. Introductory part: **heading**

- states the name + address of the institution distributing the Q or the name of its author;
- states the Q' s objectives;
- underlines the importance of the respondent' s answers in solving the research problem, asks for returning;
- gives instructions how to fill it;

- **The second part: questions**
 - does not have a special logic. Mostly, the easiest and attractive qs are first;
 - more difficult qs are in the central part;
 - more confidential and factual qs are in the end.
- **The final part: thanks to the respondents for the cooperation**

How to create questions

1. Clear qs: all respondents understand them equally.
2. Do not use too broad qs.
3. Try to avoid expressions: *some, usually, sometimes* - respondents can interpret them differently.
4. Avoid double qs. Q has to ask only one thing.
5. Ask only qs the respondents can answer.

6. Qs must be meaningful for Rs
7. Create simple Qs- long ones are confusing, make RS unmotivated and slow the pace.
8. Avoid negative expressions – can be interpreted improperly and thus can be answered positively – if needed, highlight the negative form. No double negation!
9. Avoid possible prejudice in qs (wrong: *Do you agree or disagree with the headmaster's proposal about...*).
10. Some Qs can be answered as it is socially needed – not what the R thinks about it – have options (*sometimes yes, sometimes no, it depends*)

It is advisable to check the Qs's correctness in a *probe* - in a form of an interview.

- **TYPES OF QUESTIONS**

1. **Closed Qs** - offer alternatives, R has to mark (underline, circle) the adequate answer.

E.g. *Do you think it is necessary for gifted learners to create special classes?*

a) yes b) no c) I have no opinion

Then it is a **dichotomic Q – c)** option is very important here; or use alternative: „*Other (describe, please)*“= it is a *semi-closed Q*

2. OPEN QS give Rs freedom, do not limit them. E.g. *Explain, why you disagree with creating special classes for gifted learners.*

They are more difficult to answer and process/evaluate. Each OQ can have about 15 various answers. They are used mostly in explorative researches and probes.

3. SEMI CLOSED QS offer first – an alternative answer, then ask for explanation/clarification in a form of an OQ.

E.g. Do you agree with creating special classes for gifted learners? Yes – no. If yes, why?

4. SCALE QS (see part 5.1)

- Variability in types of questions is recommended! But avoid too frequent changes of types.
- Validity of types of questions:
 - factual information has high validity (age, genre, address, employment, education etc);
 - factual info, which needs guessing, have lower validity;
 - much lower validity have Qs asking for attitudes, opinions, motives.

- Anonymous Qs bring more truthful responses- but can be considered not important and are superficially responded.
- *L-questions* (lie-qs): a method revealing the R's tendency to „lie“. Sum score of the R's responses to the L-Qs enables to count his/her L-score.
- Reliability of the Q depends on more features: e.g. on inner consistency of the Q = more Qs asking for a similar kind of info.

- Length of the Q - is hard to specify (up to 45 minutes!), usually around 20 min for adults.
- Return of the Q is expressed in per cent. A very good one is 75% but is frequently much lower.
- Covering Letter explains the reason and asks for filling and sending the Q back to the researcher.

5. Creating own questionnaire

Research Problem: You want to know what teaching aids teachers use.

Task:

1. Make questions (how many qs would you use?)
2. Use more types of questions.
3. Use various scales. What symbols would you use? Think of the form of space for answers.
4. Write a Covering Letter / Heading

Literature

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