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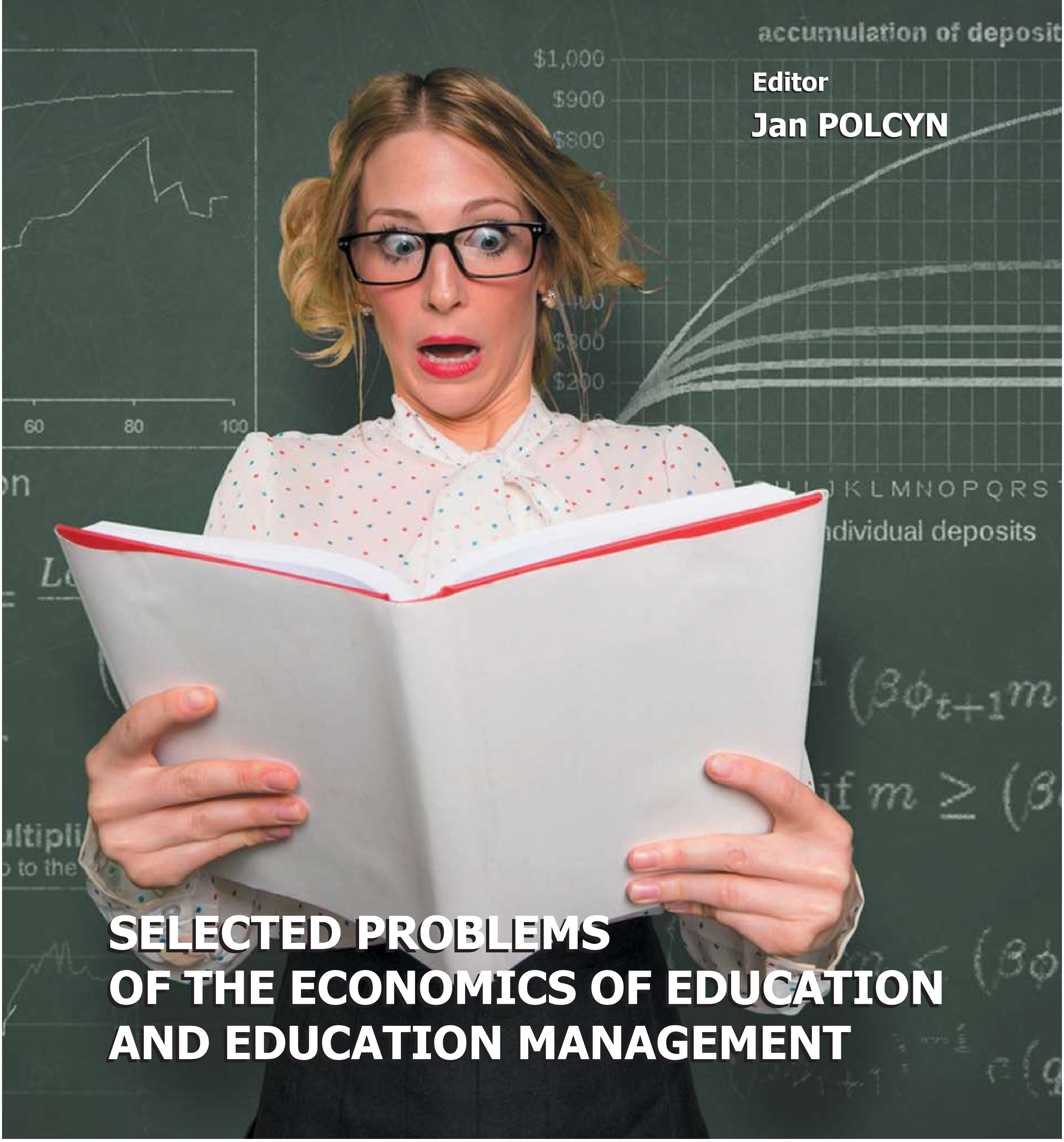

SELECTED PROBLEMS OF THE ECONOMICS OF EDUCATION AND EDUCATION MANAGEMENT

PWSZ
w Pile

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METHODOLOGICAL AND ETHICAL ASPECTS OF RESEARCH IN EDUCATION

ANNA TURCZAK*

Introduction

The root of the word 'science' is the Latin *scientia*, which simply means 'knowledge'. The purpose of science is understanding the world. Scientists describe what they see, discover regularities, and formulate theories (Babbie, 1990).

Over time, science results is an accumulation of specific findings, theories, and other knowledge. In this sense, science is said to be progressive. When researchers conduct new research studies, they try to build on and extend current research theories and results. At the same time, science is dynamic and open to new ideas and theories that show promise. Different researchers approach research differently, and they often describe, explain, and interpret things in different though often complementary ways. Consequently, science is a never-ending process (Johnson, Christensen, 2012, p. 15).

Science offers a set of logical, systematic, documented methods. In educational research the scientific methods are used to investigate teaching and learning. Also the knowledge produced by these investigations can be named educational research.

Education is a broad field that includes many different research areas. Since educational research builds on the methods of science, it relies on logical and systematic methods to answer a variety of questions, and it does so in a way that allows others to inspect and evaluate it.

Educational research at present is marked by three qualities – it is eclectic, dynamic, and essential. Eclectic means coming from many sources. Indeed, many disciplines and schools of thought contribute to educational research. Dynamic, in turn, means rapidly developing, with new ideas and

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methods emerging on a regular basis. Educational research is also recognized as necessary for the optimal evolution of schooling.

Educational researchers strive to fulfil three goals: validity, authenticity, and practical significance. Validity refers to the accuracy and trustworthiness of instruments, data, and findings in research. Nothing in research is more important than validity (Bernard, 2013, p. 45).

Authenticity is also a worthy goal for all educational research endeavours. An authentic understanding of an educational process or educational setting is one that reflects fairly the various perspectives of participants (Gubrium, Holstein, 1997).

Researchers have an obligation to ask questions and produce conclusions that are in some way useful to others, particularly to moving forward the collective enterprise of teaching and learning (Check, Schutt, 2012, p. 39). Thus, practical significance is a very important goal for educational researchers.

Research ethics are a guiding set of principles that are to assist researchers in conducting ethical studies. E. Diener and R. Crandall (1978) have identified three areas of ethical concern for all social and behavioural scientists: (1) the relationship between society and science, (2) professional issues, and (3) the treatment of research participants.

The ethical problem regarding the relationship between society and science revolves around the extent to which societal concerns and cultural values should direct the course of research. The category of professional issues includes the expanding problem of research misconduct, i.e. the fabrication, falsification, or plagiarism in proposing, performing, or reviewing research or reporting research results (Johnson, Christensen, 2012, p. 101).

However, treatment of research participants is the most important and fundamental issue that researchers confront. This is because conduct of research with humans has the potential for creating harm. Before a person can participate in a research study, the researcher must give the prospective participant a description of all features of the study that might reasonably influence his or her willingness to participate.

Finally, educational research requires ethical consideration at all stages: in the decision to research one topic over another, in choosing one method over another, in the conduct of data collection and analysis, and in the dissemination of findings (as well as in limiting the dissemination of such identifiers as might damage research participants).

Research design

Objects are the persons, places, or things on which research is done. The object is also called the unit of analysis. Usually, the objects of a study in educational research are people or persons (pupils, students, teachers), but they can be places such as schools, or they can be things such as curriculum programmes (Hoy, 2010, p. 30).

Properties are the characteristics or attributes of an object. A variable is a property that takes on different values. The value represents either magnitude of the variable (e.g. the length of a school day or school year) or a category of the variable (e.g. male or female). A variable must have at least two values (unlike a constant which has only one value).

Research methods vary, but the goal of research is almost always the same: to answer a question or a group of related questions. The questions may range from ‘What is A like?’ to ‘Does A cause B?’. Educational research answers questions important to pupils, students, teachers, administrators, parents, and other stakeholders (Boudah, 2011, p. 2).

Research is a broad term that means the systematic and rigorous process. The usual steps of the process are as follows:

- ❑ selecting a research topic and identifying a research problem;
- ❑ formulating a focused question;
- ❑ determining what is already known about the problem and question;
- ❑ developing a hypothesis;
- ❑ collecting and analysing relevant data;
- ❑ drawing conclusions;
- ❑ sharing the conclusions with others.

As stated above, the first step in conducting a research study is choosing a research topic and then identifying a research problem in need of a solution. It is worth emphasizing in this context that the field of education has numerous problems that are really in need of solutions (Johnson, Christensen, 2012, p. 82).

Research questions should be clear and specific. They also should be feasible (i.e. within the time and resources available), educationally important, and scientifically relevant (King, Keohane, Verba, 1994).

Researchers must be able to conduct any study within the time and resources they have. If time is short, questions that involve long-term investigation may not be feasible. Another issue is whether any additional resources will be available, such as research funds or other researchers to collaborate with. It is obvious that there are severe limits on what one person can accomplish.

The constraints faced due to schedules and other commitments, as well as skill level also have to be taken into account.

Educational research is not a simple undertaking. Thus, the expenditure of effort and resources should be focused on a substantive areas. The key issue seems to be whether the research is important to other people and whether an answer to the research question makes a difference for society or for educational relations.

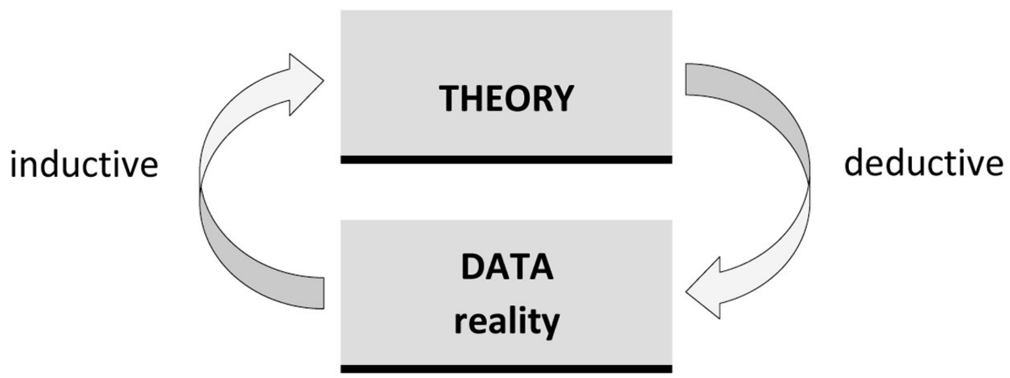
Every research question should be grounded in the educational research literature. Whatever question was formulated, it is a must to turn to the relevant literature first to find out what already has been learned about this question.

Conducting a thorough search of the literature and then reviewing critically what has been found is an essential foundation for any research project.

What should be particularly emphasized is that educational research relies on analytic thinking, and one important element of analytic thinking is avoiding errors in logic. Readers have a right to expect rigorous thinking in research articles. Errors in thinking can occur in the way a research question is constructed, the methods used to carry it out, or the conclusions the researcher draws (Check, Schutt, 2012, p. 6).

In general, to conduct educational research means to attempt to connect theory with empirical data – the evidence obtained from the educational world. Researchers may make this connection by starting with an educational theory and then testing some of its implications with data. This is the process of deductive research. Alternatively, researchers may link educational theory with data by first collecting the data and then developing a theory that explains patterns in the data. This is the inductive research process (see Figure 1).

Fig. 4. The links between theory and data



Source: own compilation based on (Check, Schutt, 2012, p. 34).

As Figure 1 shows, in deductive research, a specific expectation is deduced from a general theoretical premise and then tested with data that have been collected for this purpose. In contrast to deductive research, inductive research begins with specific data, which are then used to develop a general explanation (a theory) to account for the data.

Most educational researchers use both inductive and deductive reasoning when they conduct research. For example, they use inductive reasoning when they search for patterns in their particular data, when they make generalizations from samples to populations, and when they make inferences as to the explanation. Researchers use deductive reasoning when they deduce from their hypotheses the observable consequences that should occur with new empirical data if their hypotheses are true. Researchers also use deductive reasoning if they conclude that a theory is false (Johnson, Christensen, 2012, p. 33).

Variables and levels of measurement

Conceptualization is the process of specifying what is meant by a term. Concepts are operationalized in research by one or more indicators, or measures. Operationalization is the necessary link between conceptualization and measurement.

A variable is a property that can take more than one value. Values can be words or numbers. Generally speaking, research is about variables (that is about characteristics of people, organizations, countries, or other units of analysis) and how variables are related to one another.

A variable is always defined at some level of measurement. The four levels of measurement can be ordered by complexity of the mathematical operations they permit: nominal (least complex), ordinal, interval, and ratio (most complex).

The nominal level of measurement, also called categorical level, identifies variables which vary in kind or quality but not in amount. The values of a nominal variable comprise a list of names. For gender, obviously, one can assign the numeral 1 to men and 2 to women, but gender will still be a nominal variable. Clearly, the number 2 happens to be twice as big as the number 1, but this fact is meaningless with categorical variables. Moreover, it is impossible to add up all the 1s and 2s and calculate average sex (Bernard, 2013, p. 41).

The values for a nominal variable must be exhaustive and mutually exclusive. Exhaustive means that all possible categories have been named and therefore each object can be assigned a value. In turn, mutually exclusive means that each object can have one and only one value (i.e. objects cannot belong to more than one category at a time).

Like nominal variables, ordinal variables are also exhaustive and mutually exclusive, but they have one additional property: their values can be rank ordered, but this order does not have equal intervals between items (Alreck, Settle, 2004). For example, any variable measured as high, medium, or low is ordinal.

Scales of opinion – like ‘strongly agree’, ‘agree’, ‘neutral’, ‘disagree’, ‘strongly disagree’ – found on so many surveys are the values of an ordinal variable. The variable measures an internal state, agreement, in terms of less and more, but not in terms of how much less or more. This is the most important characteristic of ordinal measures: there is no way to tell how far apart the attributes are from one another. A person who ‘agrees strongly’ with a statement may agree twice as much as someone who says they ‘agree’, or ten times as much, or half again as much. There is no way to tell (Bernard, 2013, p. 42).

Interval variables have all the properties of nominal and ordinal variables. They are an exhaustive and mutually exclusive list of values, and the values have a rank order structure. They have one additional property, as well: the distances between the values are meaningful. To exemplify, the difference between an IQ score of 80 and 90 is the same (i.e. 10) as the difference between one of 150 and 160. On the other hand, a person who has an IQ of 135 is not 50% smarter than a person with an IQ of 90. That is because a variable, at the interval level of measurement, has no true zero point. Therefore, numbers can be added and subtracted, but ratios of them – for instance 160 to 80 as 'twice as much' – are not meaningful.

Ratio variables are interval variables that have a true zero point – that is, the value 0 that measures the absence of the phenomenon being measured. Values of ratio variables can be added and subtracted, and because the numbers begin at a true zero point, they can be multiplied and divided (so ratios can be formed between the numbers). Consequently, 20 is 4 points higher than 16 and is also 2 times as great as 10. Some examples of ratio variables include: age, number of years of education, number of times a person has changed their residence, income, population size. Undeniably, a person who is 50 years old is 10 years older than a person who is 40, and a person who is 30 is 10 years older than a person who is 20. The 10-year intervals are identical. In addition, a person who is 40 is twice as old as a person who is 20; and a person who is 80 is twice as old as a person who is 40.

Interestingly, number of years of education is usually treated as a ratio variable, even though a year of primary school is hardly worth the same as a year of high school (Bernard, 2013, p. 43).

Table 1 summarizes the types of comparisons that can be made with different levels of measurement, as well as the mathematical operations that are legitimate.

Tab. 6. Properties of measurement levels

Examples of comparison statements	Appropriate math operations	Relevant level of measurement			
		nominal	ordinal	interval	ratio
A is equal to (not equal to) **B**	$=$ ($\neq$)	yes	yes	yes	yes
A is greater than (less than) **B**	$>$ ($<$)	no	yes	yes	yes
A is three more than (less than) **B**	$+$ ($-$)	no	no	yes	yes
A is twice (half) as large as **B**	$\times$ ($\div$)	no	no	no	yes

Source: own compilation based on (Check, Schutt, 2012, p. 80).

It is always possible to turn a variable measured at the ratio or interval level into an ordinal or a nominal variable, but it is impossible to go the other way. This is why the general principle in research is to measure at the highest level of measurement possible.

Sampling

The population is the entire set of individuals or other entities to which study findings are to be generalized. A sample is a subgroup of the population. Parameters are the characteristics of populations. Statistics are the characteristics of samples.

Researchers rarely have the resources to study the entire population that is of interest to them, so they have to select a representative sample of cases so that their findings can be generalized to the population of interest. A representative sample is a sample that 'looks like' the population from which it was selected in all respects that are potentially relevant to the study. The distribution of values among the elements of a representative sample is the same as the distribution of those values among the total population. Contrarily, in an unrepresentative sample, some characteristics are overrepresented or underrepresented (Check, Schutt, 2012, p. 95).

It is obvious that the more representative the sample, the better. Certain features of samples make them more or less likely to represent properly the population from which they are selected. In this regard, the crucial distinction about samples is whether they are based on a probability or a nonprobability sampling method.

Probability sampling methods rely on a random selection procedure to ensure no systematic bias. In a probability sample, the odds of selecting elements are known and every unit has an equal chance of being chosen for study. In a census of all the elements of a population, the probability that any particular element will be picked out is 1. If half of the elements in the population are sampled on the basis of chance, the probability of selection for each element is 0.5. As the size of the sample as a proportion of the population decreases, so does the probability of selection (Check, Schutt, 2012, p. 96).

There are several ways to take probability samples, among them: simple random sampling, stratified random sampling, and cluster random sampling.

Simple random sampling involves generating a list of random numbers and applying that list to a numbered sampling frame (i.e. a list of the population elements).

Stratified random samples are used to ensure that key subgroups are covered by a study. Most often, disproportionate stratified sampling is used to make sure that important but relatively small subpopulations are included in a sample (e.g. disabled students).

Cluster sampling involves choosing given physical or geographic areas and identifying a certain number of units to be picked out from each area. For example, one can designate areas within the country as either city or rural areas and select a set number of participants from the different areas.

It is often impossible to do strict probability sampling under real research conditions. In these cases nonprobability sampling methods can be useful. Nonprobability samples are used, for instance, when it is difficult to identify all potential cases in the population. Some types of nonprobability sampling methods are: quota sampling, judgement (purposive) sampling, convenience (haphazard) sampling, and snowball sampling.

In quota sampling, the researcher decides on the subpopulations of interest and on the proportions of those subpopulations in the final sample. Quota sampling resembles stratified probability sampling, but respondents are not chosen randomly.

In judgment, or purposive sampling, there is no overall sampling design that tells the researcher how many of each type of elements is needed for a study. Thus, the units are selected according to the researcher's own knowledge and opinion about which ones they think will be appropriate to the topic area.

A convenience, or haphazard sample is a sample of participants who happen to be readily accessible to the researcher – particular individuals are selected simply due to ease of access. This technique is especially useful for pretesting questionnaires to make sure that the items are unambiguous.

In snowball sampling, the researcher locates one or more key informants and asks them to name others who would be likely candidates for the research. In fact, snowball sampling is a useful technique when a population is hidden or difficult to identify. Further, it is used in studies of social networks, where the objective is to find out who people know and how they know each other.

Qualitative and quantitative research

The research design and methods must be appropriate to explore the initial research question in a satisfying way. The reality is that different types of research methods and approaches may work together coherently to achieve better understanding of a research question or educational situation.

One of the most common divisions in educational research is the distinction between qualitative research and quantitative research. Admittedly, both qualitative and quantitative researchers collect data, but the data and the methods they use to analyse the data differ substantially. Pure qualitative research relies on the collection of qualitative data (i.e. nonnumerical data such as words and pictures). Pure quantitative research, in turn, relies on the collection of quantitative data (i.e. numerical data).

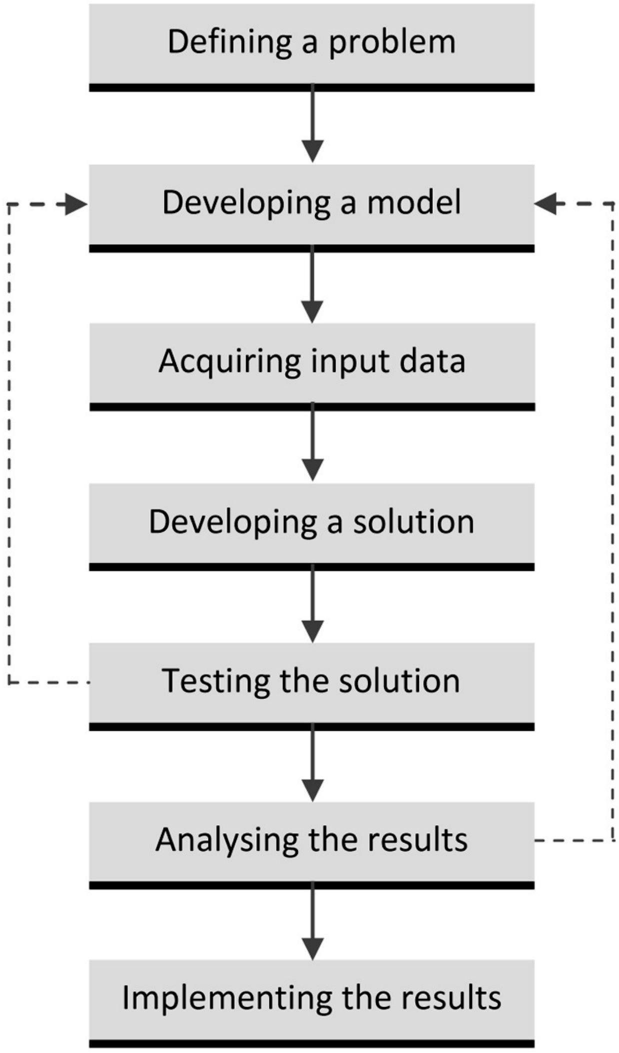
The selection of adequate research method always depends on the purpose of the study. However, W. K. Hoy (2010) argues that there should not be a sharp dichotomy between qualitative and quantitative research. According to this scientist, the two approaches are fully complementary, not competing. What is more, both are equally valuable for educational researchers.

Qualitative methods refer to several distinctive research activities:

- Participant observation is a method for gathering data that involves developing a sustained relationship with people while they go about their normal activities.
- Intensive (depth) interviewing is a method that involves open-ended, relatively unstructured questioning in which the interviewer seeks in-depth information on the interviewee's experiences, perceptions, and feelings (Lofland *et al.*, 2005).
- In the case of focus groups the method of unstructured group interviews is used and in those interviews the focus group leader activity encourages discussion among participants on the topics of interest. The purpose of focus groups is to use the interaction between a group of interviewees to generate discussion about a given problem. This discussion, it is hoped, will be more detailed and wide ranging than would result from a one-to-one interview (David, Sutton, 2011, p. 133).

It is easy to notice, anyway, that quantitative techniques are the ones that have been developing very fast recently and have been applied successfully to an increasingly wide variety of complex problems in education. The typical analysis in such quantitative study consists of defining a problem, developing a model, acquiring input data, developing a solution, testing the solution, analysing the results, and implementing the results (see Figure 8). However, it is worth adding that one step does not have to be finished completely before the next is started. In most cases one or more of these steps will be modified to some extent before the final results are implemented. This would cause all the subsequent steps to be changed. In some cases, testing the solution might reveal that the model or the input data are not correct. This situation could mean that all steps that follow defining the problem would need to be modified (Render, Stair, 1997, p. 3).

Fig. 5. The quantitative analysis approach



Source: own compilation based on (Render, Stair, 1997, p. 3).

The first step in the quantitative approach is to develop a clear, concise statement of the problem. This statement will give direction and meaning to the following steps.

Once the problem is selected, the next step is to develop a model. The accuracy of the solution depends on the accuracy of the input data and the model. All models should be solvable, realistic, and easy to understand and modify. Additionally, the required input data should be obtainable.

Analysing the results starts with determining the implications of the solution. In most cases, a solution to a problem will result in some kind of action or change in the way something is operating. The implications of these actions or changes must be determined before the results are implemented.

Because a model is only an approximation of reality, the sensitivity of the solution to changes in the model and input data is a very important part of the study. The sensitivity analysis shows how much the solution would change if there were changes in the model or the input data. It has to be strongly highlighted here that before a solution can be implemented, it needs to be tested completely.

The final step is to implement the results. This is the process of incorporating the solution into reality. Unfortunately, this can at times be very difficult. Even in the case of an optimal solution, if decision makers resist the new solution, all of the efforts are of no value.

After the solution has been implemented successfully, it should be closely monitored. Over time, there may occur numerous changes that call for modifications of the original solution.

Hypothesis testing

In quantitative research, the research question is often followed by a hypothesis. A hypothesis is a claim or statement about a characteristic of the entire population of interest (e.g. the value of a population parameter). Hypothesis testing is a procedure based on sample evidence and probability theory to determine whether the hypothesis is a reasonable statement and should not be rejected, or is unreasonable and should be rejected. In general, the logic of hypothesis testing involves setting up a null hypothesis, H_0, and an alternative hypothesis, H_1, and then trying to falsify the null hypothesis.

There is a five-step procedure that systematizes hypothesis testing. The steps are as follows (Mason, Lind, 1990, p. 358):

1. State null and alternative hypotheses.
2. Select a level of significance (that is the risk of rejecting the null hypothesis when it is actually true).
3. Identify the test statistic.
4. Formulate a decision rule.
5. Take a sample and arrive at decision (i.e. accept H_0 or reject H_0 and accept H_1).

A null hypothesis, H_0, is a hypothesis to be tested. An alternative hypothesis, H_1, is a hypothesis to be considered as an alternative to the null hypothesis. Thus, the problem in hypothesis testing is simply to decide whether the null hypothesis should be accepted, or rejected in favour of the alternative hypothesis (Weiss, 2012, p. 341).

The null hypothesis always contains a statement of equality ($=$). In turn, the choice of the form of alternative hypothesis depends on and should reflect the purpose of the test which is being carried out. Generally speaking, tests can be one-tailed or two-tailed. A test is one-tailed when the alternative hypothesis precisely states a direction ($<$ or $>$). In the left-tailed test the direction of the inequality sign in the alternative hypothesis points to the left ($<$), while in the right-tailed test the direction of the inequality sign in the alternative hypothesis points to the right ($>$). If no direction is specified under the alternative hypothesis – it is the case of ^{1} sign – a two-tailed test is being applied (Sullivan, 2011, p. 457).

A decision rule is a statement of the conditions under which the null hypothesis is accepted or rejected. To accomplish this, the sample statistic distribution is divided into two regions, aptly called the region of acceptance and the region of rejection. The region of rejection defines the location of all those values that are so large or so small that the probability of their occurrence under a true null hypothesis is rather remote (Mason, Lind, 1990, p. 362).

Accepting the null hypothesis does not prove that H_0 is true – to prove without any doubt that the null hypothesis is true, the population characteristic would have to be known. To actually prove it, one would have to examine every item in the population and this is usually not feasible.

Causation

Educational research concerns, among other issues, defining variables, looking for associations among them, and trying to understand whether and how variation in one thing causes variation in another.

A cause-and-effect relationship is a relationship in which one variable affects another variable. Which is extremely important, association is not a sufficient condition for claiming a causal relation between two variables, but it is a necessary condition.

An independent variable is a variable that is presumed to cause changes to occur in another variable. Sometimes the independent variable is manipulated by the researcher (i.e. the researcher determines the value of the independent variable). At other times, the independent variable is studied by the researcher but is not directly manipulated (i.e. the researcher studies what happens when an independent variable changes naturally). The independent variable is an antecedent one because it must come before another variable if it is to produce a change in it.

A dependent variable is the variable that is presumed to be influenced by one or more variables. Thus, the dependent (i.e. consequent) variable is the one that is dependent on the independent variable (or variables).

Another type of a variable is an intervening variable. An intervening variable, also commonly called a mediating variable, is a variable that comes in between other variables, helping to delineate the process through which those variables affect one another (Johnson, Christensen, 2012, p. 38).

A causal effect is said to occur if variation in the independent variable is followed by variation in the dependent variable, when all other things are equal (*ceteris paribus*). The following statement exemplifies this kind of relationship: ‘Frustration leads to aggression’. The presumed cause is ‘frustration’, and the presumed consequence is ‘aggression’. Thus, in this example of the cause-and-effect relationship, 'frustration' is the independent variable and 'aggression' is the dependent variable.

A researcher can be reasonably confident that one variable causes another if four conditions are met (Bernard, 2013, p. 51):

1. The two variables co-vary – that is, as scores for one variable increase or decrease, scores for the other variable increase or decrease as well.
2. The correlation between the two variables is not spurious.
3. There is a logical time order to the variables – the presumed causal variable must always precede the other in time.
4. A mechanism is available that explains how the independent variable causes the dependent variable (there must, in other words, be a theory behind this).

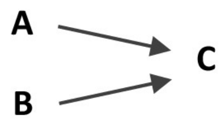
So, it turns out that – besides a nonspurious correlation – something else is required to establish a cause-and-effect relation between two variables: a logical time order. Figure 3 shows a few possible forms of time order between variables.

Furthermore, even when the researcher has established nonspurious relationship and a logical time sequence for two or more variables, a theory is needed – a mechanism – that explains the causation.

Fig. 6. Time order between two or three variables

(**a**) **A** is antecedent to **B**

(**b**) **A** and **B** are antecedent to **C**



(**c**) **A** is antecedent to **B** which is an intervening variable antecedent to **C**

Source: own compilation based on (Bernard, 2013, p. 54).

In some relations, it is clear which is the independent variable, and which is the dependent variable, but in others it is not. For instance, in a study of intelligence and achievement, it is more likely that intelligence influences achievement rather than the other way around (Hoy, 2010, p. 33). There are many relationships, however, in which the causation flows both ways – that is, the first variable affects the second variable, but then the second one influences the first one. This kind of relation is called a reciprocal causation.

Forecasting

Decision makers in education are always trying to reduce uncertainty and to make better estimates of what will happen in the future. Accomplishing this is the main purpose of forecasting.

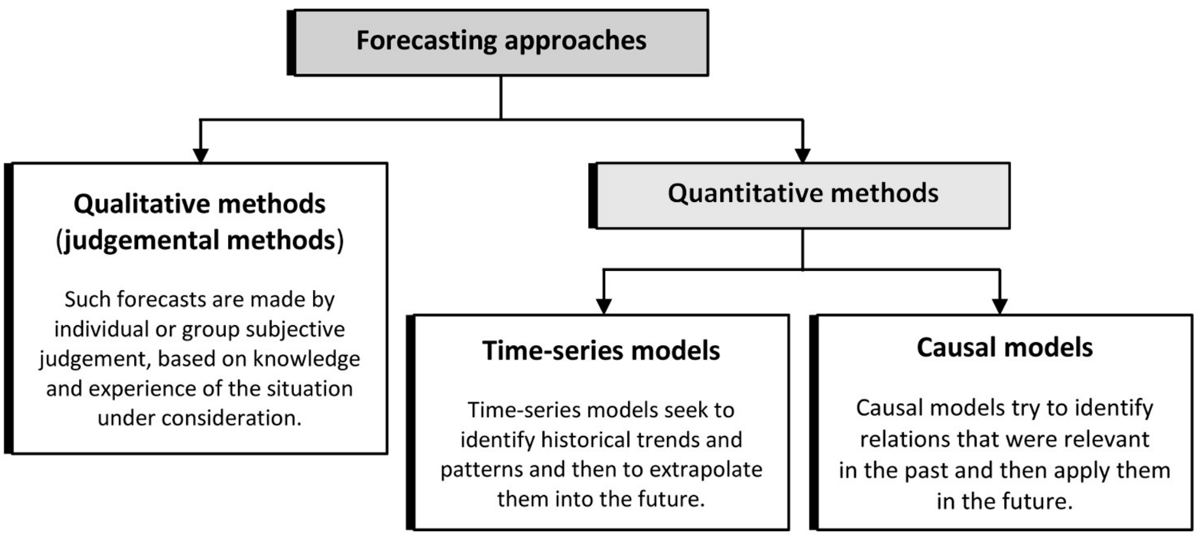
There are many ways to forecast the future. In numerous institutions (especially smaller ones), the entire process is subjective, involving intuition and years of experience. However, there are many quantitative forecasting methods – such as unweighted and weighted moving averages, exponential smoothing, trend projections, seasonality analysis, and causal regression analysis – which may turn out to be helpful.

Regardless of the model used to make the forecast, the same eight overall steps of forecasting that follow are used (Render, Stair, 1997, p. 174):

1. Define the purpose of the forecast.
2. Select the variable that is to be forecasted.
3. Determine the time horizon of the forecast (short time horizon, medium time horizon, long time horizon).
4. Select the forecasting model or models.
5. Gather the data needed to make the forecast.
6. Validate the forecasting model.
7. Make the forecast.
8. Implement the results.

All forecasting methods can be classified into one of two categories. These categories, shown in Figure 4, are qualitative methods and quantitative methods (including time-series models and causal models).

Fig. 7. Forecasting methods



Source: own elaboration.

Qualitative methods attempt to incorporate subjective factors into the forecasting. Opinions by experts, individual experiences and judgements may be considered. Qualitative methods are especially useful when subjective factors are expected to be very important or when accurate quantitative data are difficult to obtain.

Time-series models attempt to predict the future by using historical data. These models make the assumption that what happens in the future is a function of what has happened in the past. In other words, time-series models look at what has happened over a period of time and use a series of past data to make a forecast. The following methods are a few examples:

- unweighted moving averages;
- weighted moving averages;
- exponential smoothing;
- trend projections;
- seasonality analysis.

Unweighted moving averages, weighted moving averages and exponential smoothing are the simplest quantitative techniques of forecasting, but in their basic form they are useful only if it can be assumed that the variable studied will stay fairly steady over time.

As with time-series models, causal models also rely on quantitative data. However, causal models incorporate the causal variables that might influence the quantity being forecasted into the forecasting model.

Ethics in educational research

Research affects people and that is why all research has an ethical component. The ethical dilemmas in educational research are particularly profound. Everything that is interesting as a potential research focus comes fully equipped with risks to the researcher and to the people studied. These are problems that cannot be ignored because researchers are responsible for all the consequences of their actions.

It is necessary to stress at the very beginning that ethics do not provide clear, agreed solutions. The main use of ethics is merely as a way and direction for exploring dilemmas in order to understand them more clearly and deeply.

In fact, many unexpected problems may arise during educational research. Foresight, well-thought-out contracts, and attention to ethical questions can all partly help to prevent or reduce these problems.

It seems that the most important issue is to realize that it is only the pursuit of impartial knowledge that justifies any investigations with the use of human subjects. Hence, research ethics are concerned with respecting research participants throughout each step of the project – starting from choosing a research topic, and ending at sharing the conclusions with others.

Nonetheless, ethics standards are designed to protect not only participants, but also researchers and their institutions as well as the good name of science. The law tends to define minimum standards of conduct in order to prevent bad practice. However, ethics guidance serves just to raise awareness and to encourage higher standards, mainly through posing questions rather than providing decisive answers (Alderson, Morrow, 2011, p. 4).

The important problem is whether ethics standard can work in every country or rather not. One view is that cultures vary so much that each culture has its own ethics. Certainly, ethical research has to be sensitive to local concerns, values and customs, and adapt to them. Nevertheless, such issues as – for example – informing children and adults honestly, asking for their consent, and respecting their refusal should be those ethical standards that apply to every human being irrespective of cultural affiliation. Moreover, the problem of cultural differences does not refer only to individual countries – there are also too many diverse views and disagreements within each culture to allow easy generalizations about what everyone in a given place believes (Alderson, Morrow, 2011, p. 20).

Despite the fact that cultures vary, each one is not purely different from all other cultures, when so many influences flow between them. Interestingly, S. Lukes (2008) argues that among all the many varied values there are constant principles and rights that matter in every society: justice, respect, solidarity, honesty. People differ in how and why they express and experience respect, and the related feelings of dignity or humiliation, confidence or powerlessness, being valued or being exploited or deceived. However, these experiences still matter to everyone, and when researchers ask participants to help them, they have a duty to honour these universal principles and rights.

There is no doubt that the most important and fundamental ethical issue confronting the researcher is the proper treatment of research participants. Therefore, it is essential to be aware of the sensitivity of some topics. Research may become damaging to the participant's sense of self if sensitive topics are pushed without consideration. When those topics are to be addressed – and it is important to remember that what is sensitive may be understood differently by the participants than it is by the researcher – the research subject's right to withdraw must be respected. This needs to be explained to participants in advance as part of the process of gaining informed consent (David, Sutton, 2011, pp. 48–49).

Respecting the privacy of research participants is also at the heart of the conduct of ethical research. Researchers attempt to ensure the privacy of research subjects by either collecting anonymous information or ensuring that the information collected is kept confidential. Anonymity is the best way to protect privacy because anonymity means that the identity of the participants is not known to the researcher. For example, anonymity could be achieved in a survey about cheating on examinations if the survey did not ask the students for any information that could be used to identify them (e.g. name, student number) and if the survey was administrated in a manner (e.g. in a group setting) in which the researcher cannot attach a name to the completed survey instrument (Johnson, Christensen, 2012, p. 116).

In addition, research can be unethical in the sense that it asks the wrong questions, or the methods do not fit the questions. The studies may waste time and money, at best come up with useless answers, and at worst produce misleading ones that support future misguided and even harmful policies.

Educational research should maintain high standards for validity and be conducted and reported in an honest and open fashion. The concern with validity requires that scientists be open in disclosing their methods and honest in presenting their findings. This means in particular that articles or other reports should include a detailed methodology section (Check, Schutt, 2012, p. 55).

The funding contract can have powerful effects on the ethics of each project. Researchers may produce important but disturbing findings that their employers do not wish to publish, for fear of alienating patrons or funders. Contracts guard against this when they mention researchers' – not only their employers' – right to publish. Another barrier to this freedom is having to satisfy editors before publishing reports in the press (and in academic journals the peer reviewers) (Alderson, Morrow, 2011, p. 67). Despite all the problems, it has to be stressed in this place that the goal of educational research is not to come up with conclusions that people will like, but to figure out how and why some parts of the educational world operate as they do.

Impact on children and adolescents

Respect is a basic ethical principle. Listening to children can help adults to discuss and resolve children's misunderstandings. This can reduce resentment or resistance, and diminish the risk of complaints.

Further, transparent discussion can encourage the informed consent as an expression of real commitment by children and adolescents to a research study that they understand. Undoubtedly, their active cooperation and contributions are likely to support more efficient and effective research. As a consequence of such prudent approach to them, young participants will be less afraid and less likely to withdraw from a study.

Researchers who do not respect children's consent or refusal may hold and perpetuate mistaken and unethical prejudices against children. Realistic research that respects children's social and moral competence challenges prejudices, misleading stereotypes and harmful discrimination. It helps to promote ethical standards of respect and justice (Alderson, Morrow, 2011, p. 121).

The impact of research includes both the effects on young research participants during a study, and also the longer-term effects that findings might have on attitudes and policies about all similar children and adolescents, and services for them. Some effects may be even not intended.

Conclusions

Educational research is a continually developing field. This is due in part to education's dynamic relationship with other fields of study. Research has been conducted in virtually every area in the field if education but, unfortunately, many of problems have still remained unresolved.

There is no one way to carry out research in educational settings. Nevertheless, the typical outline for the research process can be broken down into the following important steps:

- ❑ choosing a research topic and identifying a research problem;
- ❑ posing a targeted question;
- ❑ searching and analysing existing literature for the current state of knowledge on the selected topic;
- ❑ developing a hypothesis;
- ❑ collecting and analysing relevant data;
- ❑ drawing conclusions;
- ❑ communicating the findings to others.

Measurement – as the process of linking abstract concepts to empirical indicants – has the crucial role in science (Carmines, Zeller, 1979, p. 10). The fact is that much educational research focuses on analysing the educational world using variables. Variables should be understood as the characteristics or properties of people, organizations, countries, or other units of analysis that vary (i.e. take on different values).

Variables can be defined into four different data types, known as levels of measurement, according to the particular features of the data. There are the following levels of measurement: nominal, ordinal, interval, and ratio.

The population is the entire set of units that a researcher is keen to investigate. Actually, when the population is known and is small enough, it may be possible to examine the entire group. However, for the majority of research the population either is too large or is unknown at the outset of the research. In these instances a sample can be selected for the research study. Indeed, sampling is a powerful tool for educational research.

Probability sampling methods rely on a random selection procedure – nothing but chance determines which elements are included in the sample. The probability of picking out is known and is greater than zero. In probability samples, each individual has exactly the same chance as every other individual of being chosen. This feature of probability samples makes them much more desirable than nonprobability samples when the goal is to generalize to a larger population. However, nonprobability sampling methods are also useful, especially when random sampling is not possible. For example, they can be used when no convenient sampling frame of the population is available, or when time or cost restrictions make surveying of the entire population impractical.

The type of reasoning in educational research can be described as deductive or inductive. Research based on deductive reasoning proceeds from general ideas, deduces specific expectations from these ideas, and then tests the ideas with empirical data. Research based on inductive reasoning begins with specific data and then develops general ideas or theories to explain patterns in the data.

Identification of relationships between variables is the goal of much educational research. It is important, then, to distinguish an independent variable from a dependent variable. An independent variable is a variable that is hypothesized to cause, or lead to, variation in another variable. A dependent variable is a variable that is hypothesized to vary depending on, or under the influence of, the independent variable. Thus, a cause-and-effect relationship between an independent variable and a dependent variable is present when changes in the first one tend to cause changes in the second one (although, in the case of reciprocal causation the causal connection flows both ways).

Sometimes an intervening variable, also called a mediating variable, can occur between two other variables in a causal chain. The intervening variable can help to understand the process through which the independent variable and the dependent variable affect one another (Kenny, Kashy, Bolger, 1998).

Consideration of research ethics is a necessary part of the development and implementation of any research study. Understanding ethical principles and procedures assists a researcher in preventing abuses that could occur and help delineate his or her responsibilities as an investigator (Johnson, Christensen, 2012, p. 99).

Research ethics have to be based on a realistic assessment of the overall potential for harm and benefit to research subjects. Researchers must make every effort to foresee possible risks and to weigh the possible benefits of the research against these risks. The benefits to subjects of the research should be always maximized and the risks for them should be always minimized (Sieber, 1992, pp. 75–108).

Protecting participants is the primary focus of research ethics. Risks in educational research include distress and anxiety, embarrassment and loss of self-esteem. Other usual harms in educational research, such as inconvenience, time lost, intrusion and mental discomfort, may seem slight. However, these could be very serious to the person concerned. People can feel wronged by research, if they feel they have been deceived or humiliated, or that their privacy or values have been disregarded, or their views were misreported. Research ethics are intended to help researchers to plan ahead and prevent such problem (Allen, 2005; Danby, Farrell, 2005; Morrow, 2005).

Educational researchers who conduct research on behalf of organizations – a school, a school system, a funding agency implementing a new programme – may face additional difficulties when the organization, instead of the researcher, controls the final report and the publicity it receives. If organizational leaders decide that particular research results are unwelcome, the researcher's desire to have findings used appropriately and reported fully can conflict with contractual obligations. Researchers can often anticipate such dilemmas in advance and resolve them when the contract for research is negotiated, or simply decline a particular research opportunity altogether. But often, such problems come up only after a report has been drafted, or the problems are ignored by a researcher who needs to have a job or needs to maintain particular personal relationships. These possibilities cannot be avoided entirely, but because of them, it is always important to acknowledge the source of research funding in reports and to consider carefully the sources of funding for research reports written by others (Check, Schutt, 2012, p. 61).

Ethical management and budgeting of a research project involve treatment of the whole research team with care and respect enabling them all to respect the participants, to develop their own ideas, analyse data in depth, and report the research widely (Alderson, Morrow, 2011, p. 66).

To sum up, research involving human subjects needs to be ethical through all its stages – in its selecting, in its conduct and in the distribution of its findings. Researchers must also consider the use to which their work is put. Although some researchers believe that personal values should be left outside the research setting, fortunately more of them feel that it is proper – even necessary – to concern themselves with the way their research is used.

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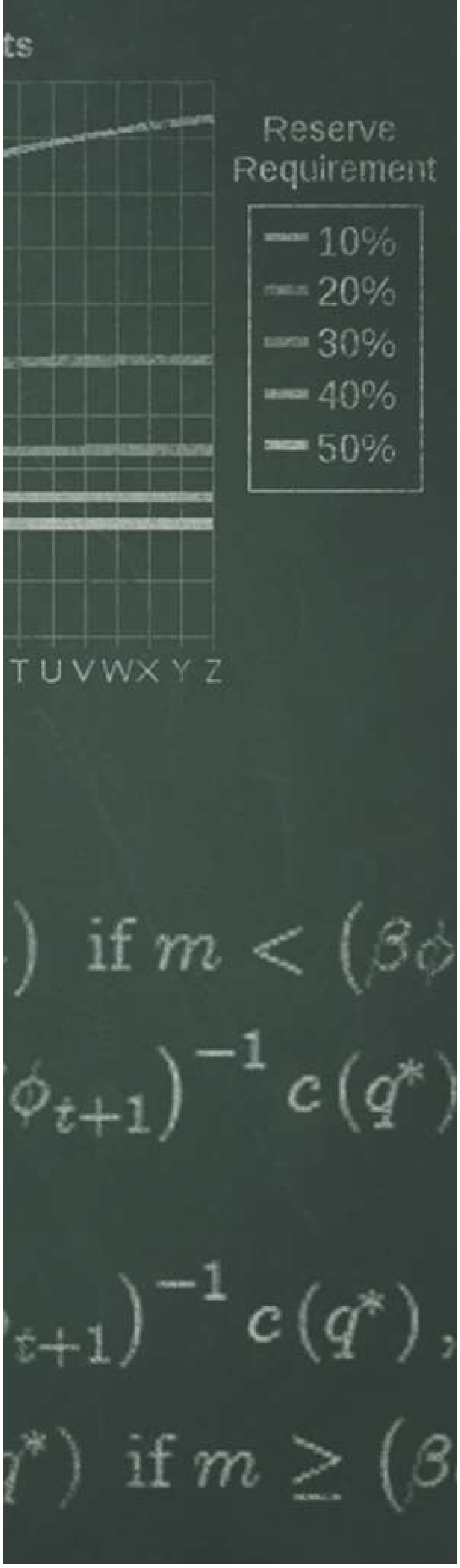

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