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Promoting ACTIVE and Responsible Citizenship in Schools



Toolkit

I. Methodology for teachers

MODULE 3 Research phase

Designing research, methods and collecting evidence



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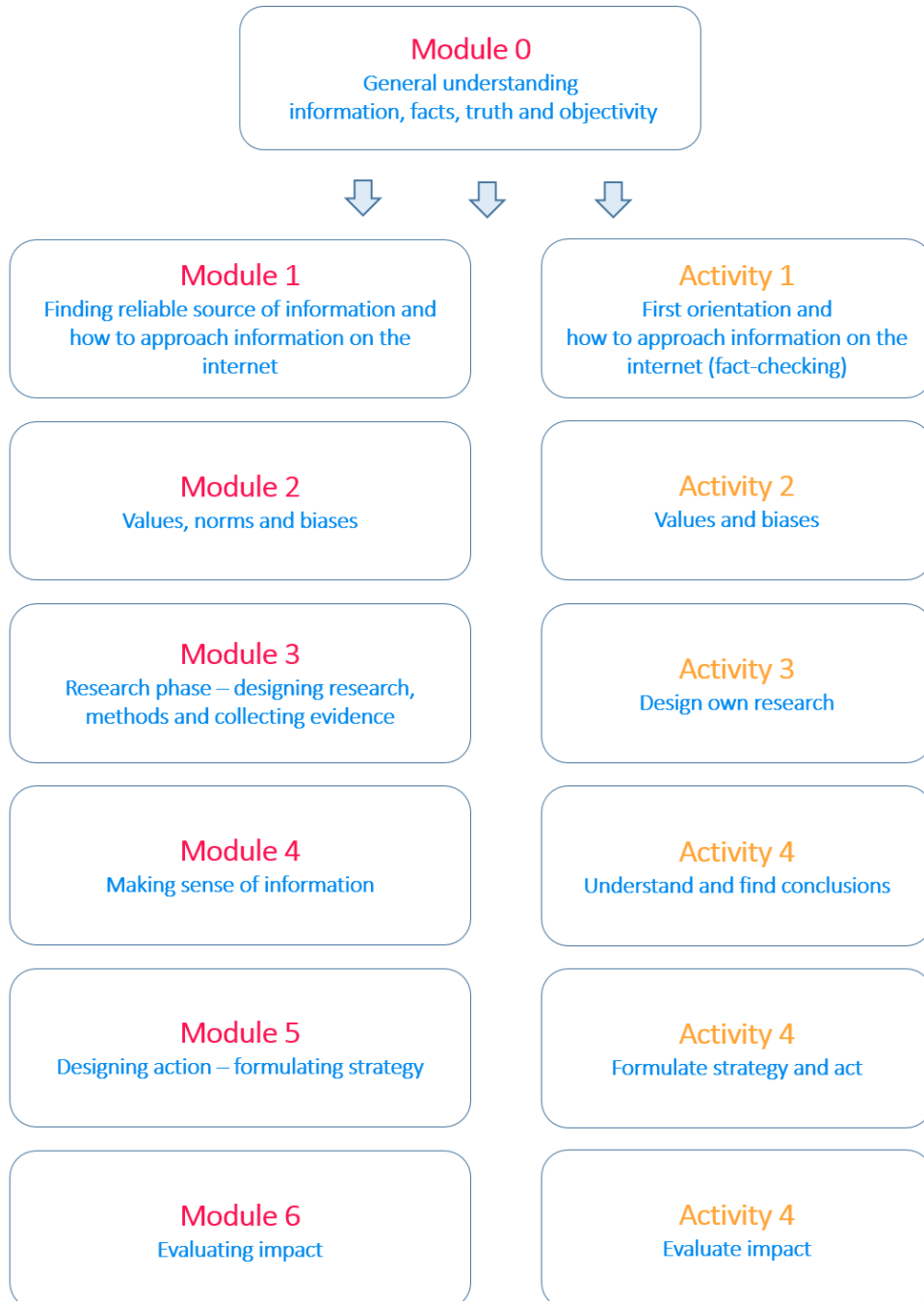
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Module and Activity overview

Modules & Activities





MODULE 3: Research phase – designing research, methods and collecting evidence

"IF WE DO NOT KNOW AND WE THINK WE KNOW,
THEN WE HAVE DESTROYED ALL THE POSSIBILITIES" (Indian yogi)

Structure of the module:

Topics covered:

- ✚ Principles for collecting data as evidence
 - ✚ Indicative and deductive approach
 - ✚ Triangulation
 - ✚ Healthy skepticism
- ✚ Methods for collecting evidence
 - ✚ Desk research
 - ✚ Field research
- ✚ Designing own research
 - ✚ Research goals
 - ✚ Research questions
 - ✚ Phases of the research process

Main topics of the module:

In this module we will explore following topics:

How to explore an issue (problem/concerned topic) and collect evidence?

How to design own research?

What to consider when collecting information – relevance, reliability and accessibility?

How to get reliable and relevant information – triangulation?

What research method to use?

What do I get out of qualitative and quantitative research?

What and how to ask research questions?

Wot to set research criteria and research hypothesis?

1.1. Designing research

The aim of this Module is to provide guidance how to design own research with the students in class. The research is expected to deal with the issues connected to ACTIVE approach and as such the presented approach is suited for any topic that you need to be explored more (to understand more), to find solution for something (societal or technical issue) or to test our assumptions (mainly concerning societal issues). The presented approach is to best suited for specific scientific research in laboratory concerning using specific (in advanced) defined method – actually an exercise to learn



specific scientific method. For the research approach presented to work we need some issue we need to seek and explore.

1.2. Basic principles for collecting the evidence

1.2.1. How to explore an issue (the steps)

When we need/want to deal with any issue we should be aware to set the problem or “research” questions right away. As showed in the Module 1 **solving not relevant “problem” is often the main issue** that we are not able to move forward and come with relevant solutions. Therefore as we are not limited with any particular method we can, and should, design the research according to our needs, purposes and the topic concerned.

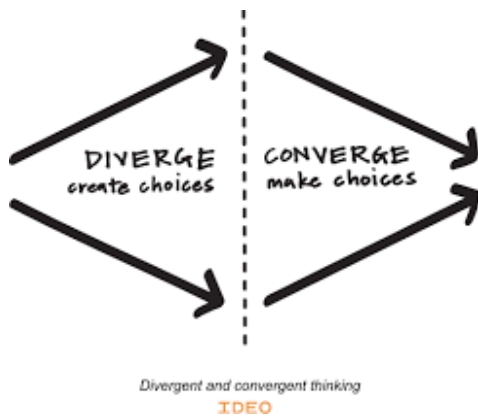
In classical research approach the research is standardly designed within **specific scientific field with specific topics, methods and approaches**. In most times the researchers follow previous research and want to fill gaps (“white spots”) of what has not been yet explained (of course also in the context of actual situation). Mostly (and this is arguable) they do not pay much attention to the formulation of the problem itself. We can say that it is quite “normal” that there are “problems” that are objects of the specific field of science without further questioning those problems itself (those are not further problematized unless someone comes with some new and disrupting finding). In other words one professor use to said that “scientists are like chicken, all will jump on the research that is trending right now”. In this case we could discuss how much are actually free to choose which topic they will explore and to witch extend they are forced or influenced to focus on certain topic (to get finances, to get prestige, to be published atc.).

IMPORTANT We should distinguish between learning or **implementing specific (scientific) method** and process of **exploring an issue or problem solving**. It is quite different approach and mind set to **design research according to the topic, needs and purposes** compared to “performing” specific (scientific) method and get and interpret the results. The question is: Are we starting with method to be used (the method is set apriority before research) or are we starting with defining the issue and questions to be solved and then finding the adequate methods to be used. And **if we are bound to specific methods** (as are used in e.g. specific field of scientific), we should **be aware of the limitations and the boundaries and actually framing of the topic based on the methods availed and used**.

When we want to **orient ourselves in certain topic** we might generally proceed inspired by design thinking approach. That mean to **start with divergent phase** were I am trying not to restrict myself in the scope of the research and then, based on the information acquired, I can begin to narrow the research and begin to formulate decision.



Design thinking approach¹



Source: <https://designthinking.ideo.com/>

We are talking about collecting evidence as **our goal is to have relevant information for or decisions**. In this sense we when collecting evidence to explore an issue or to answer specific questions we have to go beyond fact-checking and find factually accurate and relevant information.

Evidence: generally we will understand evidence as data (facts) and information that are **signs showing or proving the hypothesis or theory**. Generally speaking proving that it has happened or has or had certain properties. The evidence can be categorized by its relevance and validity.

When we are designing research we should be aware of the aspects of interpreting the findings and strength of the evidence. For this reason we can recommend to see also Module 4 Making sense of information.

In the enquiry generally inductive and deductive approaches are combined in iterative process:

Inductive: from specific to general. Formulate hypothesis or theory from specific evidence (so we start with observation of specific and want to detect patterns to understand)

Deductive: from general to specific. Test existing theory/hypothesis by collecting evidence (so we start with a theory and hypothesis to be tested against evidence)

..poss. develop a picture/schema to illustrate inductive and deductive approach...

(SUMMARY) Take into the class Our goal is to collect evidence to understand the issue we are dealing with (inductive approach) and to confirm or dismiss our (or someone's) hypothesis about the issue (deductive approach). In reality we will need both as **the process will go in the following order:**

1. **collecting first information:** we will start with orientation in the issue
2. **problem definition and hypothesis:** than formulating and finding the possible explanations
 - we formulate based on the observed patterns
 - adopting from others considering different views and explanation
3. **design the research:** choose the right approach and methods for obtaining the data that enable us to support/confirm or dismiss the possible explanations (hypothesis)

¹ There is of course much more to design thinking, but for our purposes we would like to point out this basic and crucial concept of design thinking.



4. **collect data:** collect data using the selected methods and data sources
5. **make sense of it:** analyze, make a synthesis and formulate conclusions (or another hypothesis and test them) (part of Module 4)

NOTE: Even if there are already clear possible explanations (hypothesis) at the beginning, we would still suggest not to skip the step 1. So to collect the information about the issue from broader perspective and context (as not to forget about some assumptions or solve for example the “wrong problem”).

1.2.2. Basic principles for collecting evidence

When collecting evidence we should be guided by the following basic principles:

- ✓ **Collect and assess evidence:** as an expert opinions are valuable we should still consider the rule: **evidence based not eminence based information is needed**
 - we need to distinguish between opinion and evidence and assess strength of the evidence (see Module 4 for more details)
 - though we should respect the expertise and knowledge of people respected in the concerned field, they should use their expertise to provide relevant explanation supported by evidence (that’s they are experts in the field)
 - (expert) opinions need not to be dismissed but further evidence should be found to support it. If this is not possible we have to take the expert opinion in to account for our decisions but considering that (see Module 4 for more details)
- ✓ **Go beyond fact-checking: we want to understand** the situation not just fact-check the data provided. Find factually accurate and relevant information.
- ✓ **Quality of data:** The data and information that serve as evidence should comply with the quality criteria for data and information – relevance, reliability and completeness, validity (accuracy), accessibility (see below).
- ✓ **Triangulation:** follow the principle of triangulation (see below).
- ✓ **Choose relevant methods:** design the research phase (the way how the data will be collected) according to the needs and purposes of the topic (see chapter 1.5 Sources and methods to collect data).
- ✓ **Healthy skepticism:** be critical but not paranoid (see below).
- ✓ **Understand biases:** when collecting evidence we should be aware of our own biases and biases of others (see Module 2)
- ✓ **Understand limits of evidence:** not everything can be supported by evidence and many decisions are necessarily not only evidence (information) based but also based on norms and values (see more in Module 5 Goals, decision and strategy)
 - admit what you know and what you do not know
 - understand also the limits of rationality (see Module 2 Values and norms)

Triangulation: make sure to support the evidence by data from different sources and if possible by different methods. This is called triangulation, so best to have at least 3 sources/methods for the evidence:

- look up and use multiple sources
- combine multiple methods (e.g. desk research + interviews and/or questionnaire)



Healthy skepticism: We should be skeptical and critical about the data, information and presented explanations **in the pursuit of knowing, understanding and seeking**. Skepticism should drive us to seek, to explore not to believe everything or on the other hand to dismiss anything without further examination. Do not mistake skepticism with suspicion (that is paranoia). Skepticism should mean to be open not to discard everything in principle.

(SUMMARY) Take into the class We aim to collect evidence to support or dismiss our assumptions and claims. When collecting evidence follow the above mentioned principles.

1.3. What to consider when collecting data and information

If we want to collect information as evidence to support our decisions there are following aspects we should consider and take into account at least these three issues:

- ✎ Method(s) to collect data and information and triangulation
- ✎ Quality of data and information: relevance, reliability and accessibility

1.3.1. Method(s) to collect data and information and triangulation

The method: The method means procedure how is something done. In our case of gathering information it is mainly about processes and tools of obtaining data (facts) and information.

Generally we have two main sources of data:

- i. Secondary data obtained through desk research
- ii. Primary data obtained through own field research

For more detail see the next chapter where we discuss the methods that could be used during the research phase in detail.

1.3.2. Quality of data and information: relevance, reliability and accessibility

The data and information should have desired quality to be able to support our decisions. In the Module 1 we have discussed the following dimensions of quality that the data and information should have:

- Relevance
- Reliability and completeness
- Validity (accuracy)
- Accessibility

For more detail see the Module 1 Reliable source of information.

When designing our own research we should, regarding the quality of data, take into account primary the following:

- The research should concentrate to collect **relevant data** that suit purposes and goals of the research.



- The data concerning the issue should give us **complete picture**. Data cannot be ever fully complete (meaning that we will have all the data concerning the issue – that would be the reality itself). But we should cover all the key aspect of the issue concerned.
 - relevant research questions have to be asked
- When using the secondary data sources we should make sure that the data are **reliable**.
 - source of data is reliable
 - data are valid (accurate)
- We also have to consider our time and resources available to ensure accessibility of the data (for us)

For more detail about the quality criteria for data see the Module 1 Reliable source of information.

1.4. Sources and methods to collect data

We can collect data (evidence) though two general approaches:

- Secondary data are obtained through desk research
- Primary data are obtained through own field research

1.4.1. Desk research and secondary sources of data and information

By desk research we acquire so called **secondary data** because we are taking already existing data from someone else. These could be official statistic databases, web pages of governmental organizations, news, social media, other Internet sites in general (e.g. sites of NGOs, blogs, private pages etc.), scientific journals and other sources.

Secondary sources of data and information

The secondary sources of data were in detail presented in the Module 1 Reliable source of information.

For more detail how to approach information on the internet see the Module 1 and the Activity 1.

For summary let us here just list the sources of data and information broadly discussed in the Module 2:

- Official statistic databases
- Official web pages of governmental organizations
- News
- Wikipedia
- Social media
- Internet sites in general (e.g. sites of NGO, companies, blogs, private pages etc.)
- Fact-checking sites
- Scientific journals

1.4.2. Field research

We cannot give detailed description how to use the research methods but we would like to highlight key aspects so you and the students can decide what method is suitable for the questions asked. And we provide some reference to find further information about the methods and they should be used.



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Basically, there are two ways of conducting your own field research: Quantitative and qualitative. The most important thing is that they represent different logic, goals and are linked to different techniques. As will be shown later, you can also use both in the same project, an approach that has become very popular – mixed methods.

LOGIC OF RESEARCH.

QUANTITATIVE research is based around statistics. The sample, collection of data and its interpretation are oriented in a way that **measures variables**. Now, not all research problems are suited for this approach. Moreover, one of the main decisions in this approach is whether to strive – or not – for representativeness. The idea being – I have a sample that is smaller than the population I want to draw conclusions about. In this case, the sampling method becomes very difficult even for professionals. If you have this ambition, we advise you to contact a professional before you start with later phases of research. But, for smaller groups and research goals low representativeness may not be the problem. The general rule of thumb here is **keep the sample structure as close to the group structure**. Meaning, gender groups, age groups (and other relevant aspects of the groups!) should have close resemblance to the group you are going to draw conclusions. Apart from sampling, the research – given the orientation on numbers – should be highly standardized. For example, see below, questionnaire is a very good example – everybody is asked the same question and in most cases uses prefabricated answers. This is a basis for applying the main logic of quantitative research – comparing similarities and differences between the groups in sample and relating them to the examined population.

QUALITATIVE research is based more on narration than on numbers. In this logic, you are far from representing a population. You are trying to get the most personal, complex and **deep understanding of the topic**. It is also a research approach more suited for smaller groups or sensitive problems that elude standardization. Compared to quantitative approach, you are not trying to understand a population. Rather, you are trying to understand a problem in all its depth and interpretations.

MIXED METHODS. Given the above, you can in some cases mix both. You can first conduct interviews to understand a problem and then put your understanding into a more standardized form of let's say questionnaire. Or, you can find something in your quantitative research and you want to focus on that phenomena closer. You can draw conclusions from your questionnaire survey and ask about them in interviews. This is very often an approach that is related to case studies (see below).

Questionnaires and surveys

What answers they will give

Questionnaire survey is the **most used technique of quantitative approach**. It gives **standardized measurable answers to highly standardized questions**. You ask your sample the same questions, which is a basis for comparing different answers. Now, it may seem easy to come with a standardized question and offer standardized answers. That is not the case, see the section for What to be careful about below.

Given the logic, your answers should be standardized too. In most cases, you offer your respondents a measurable form of answers. That is where you apply so called **scales**. For example, in evaluation research, you can simply ask: How did you like the course. And provide a simple scale – one star to five star. With this design you can then measure the differences between groups. Did women like the course less than men? Did elderly like it more than youngsters?



However, in this design you will **never know the ultimate question why**. Why do some grade the class low while the other grade it high. Remember, we are going for at least some form of measurability and it is a questionnaire, not an interview. However, right in the next question we can ask a simple question – Why did you like the course (**open question**). An open text field is a offered form of answer and respondents are given opportunity to describe their opinions in their own words. Remember, in its raw form (e.g. 500 responses comprised of three to five sentences), you cannot apply any kind of quantitative analysis. These so called open questions work very nice in small groups where they might typically give more information than scales. If you find yourself in a situation with hundreds of these answers, they can be coded into a variable that can be carefully statistically analyzed. For this, we recommend to contact a professional since many mistakes can be done.

How to use them

As for the specific tools for surveys, you can go online and offline. Offline means paper distribution of questionnaires. Then we have two options – either the **collection is assisted or not**.

Assisted means that the questionnaire is filled together with an interviewer. They ask/read questions from the questionnaire and mark answers from the respondent. This is a classical way. The main pro here is that you have control over situation – you can see if the respondent understands or not the question, you can clarify things. The main con is time, money and also the fact that being a good interviewer is more difficult than most people think.

Unassisted means some kind of self-filling – you can hand out questionnaires to class and let the respondents fill in the answers themselves. It is totally legitimate to do so, and you still can have at least partial control over situation.

However, these days, **online surveys** are the most preferred way of conducting larger scale quantitative surveys. You can go with sending an email with word/excel format of your questionnaire. But, you lose anonymity (which in many cases is substantial) and also the received form of data will not be ready for analysis. But, in some situations (small group, non-conflicting topic, very low level of analysis), this can work since it is easy and comprehensible.

As for advanced tools, these are ever changing and related to the workflows in your organization/population. Sometimes, **GDPR and data security** has to be taken in consideration. Recommendation here is to consult the organization you represent when conducting research about their GDPR/security measures to avoid conflicts later in the survey.

The most used are **Google forms, Microsoft forms or Survio/Survey Monkey** and many others. When choosing this, take in consideration several things.

- Forms of questions, filtering – check that all the questions in your questionnaire can be put into your tool. Some free tools have limitations in this regard. As everything in the online world is changing fast, always check for that since what worked last time does not necessarily work today
- Limitations of number of questions, answers or respondents. Most of the paid services have limited features. Check for how many respondents you can have, check for the maximum number of questions mainly.
- Check also for the final output data file. Most statistical programs can work with .csv and standard excel format. Be careful, some services provide these files only for a limited time (month since the last answer, for example)



- Check also for language possibilities of the service

RESPONDENTS

Once again, be **careful with GDPR compliance**. Generally (online situation), dependent on you specific situation, you can already have a database of contacts. Mind the fact that average response rate is dropping to ten percent. We do recommend to give respondents some time to answer. At least one or two weeks. Check for your current response rate and sent one or two reminders. When collecting data offline, plan accordingly. The pro is that response rate can be higher, but the cost (time, organization) is also higher.

As mentioned before, if you really want to care for representativeness, consult it with an expert. These days, it is very difficult to give a general advice that would be applicable to various situations. The rule of thumb is, that those big representative surveys (on the level of city, region, state) should be carried out by professionals.

TERMS

It could be useful to define some following terms:

Population – the group of people you want to talk about. For example, it can be the population of your school.

Sample – the actual portion of population that you are going to hit with your survey. Respondent (or sometimes “the case”) – a single one person/entity you are collecting information on.

Stratification/Separate groups – it is in the logics of quantitative survey, you compare answers to your questions between different populations (age, gender, or can be also – in the case of school – different class populations).

There is also **a terminology connected to answers**:

You can have **closed answers** – the respondent can only choose between given answers. In that case, you should be careful and give answers that cover all the spectrum of possibilities. If unsure, after the list of definite answers you can include The other option (check if that is possible in your collection tool).

One the other side, you can give respondent the option of **open question**, which sometimes can be a must given reliability and validity. If you want a more spontaneous reaction, this is a way to go (e.g. associations – When we talk about school in general, what comes to your mind?), because giving respondents prefab answers may skew their opinion.

There is also a middle ground, so called **scales**. The idea here is, that the answer to a question is more like a continuum. Instead of a strict yes/no, you can also provide a scale in the style Very good, rather good, rather bad, very bad. You can also work with a middle option (center of the scale, neutral) and give also option I do not know.

Using of scales can be very, very tricky, and usually needs experience. The rule of thumb here is either to consult with professional, or check online for some commonly used scales. The most used is **Likert scale** and its variations, which is now very much available online (see other sources of information below). You can also research for similar questionnaires for inspiration. When it comes to scales, be aware of translation problems. Also, the scales should be rather neutral than expressive.

What to be careful about

- Research design



- Surveys are standardized, not sensitive to deep explanations
- Surveys are not suitable for sensitive topics
- Do not be long, 10 to 15 minutes of time needed for filling your questionnaire should be the limit, after that reliability lowers significantly
- Representativity
 - If you strive for it, consult it and check for your real possibilities, what looks easy on paper and theory can be impossible to get with your resources in your timeframe
 - If you are not strictly representative, be aware of it when interpreting data and get as much similarity between examined population and your sample. Remember it is not as much about the sample size compared to population, it is more the question of structure – no significant group present in your population should be omitted from the sample
- Questions
 - Everybody must understand clearly questions and answers
 - Be careful with open questions, they take time to process
 - Ask only about one thing at a time, always (Are you happy with your marriage – OK, Are you happy with your marriage and family – NOT OK
 - Mostly YES or NO questions are not adequate
 - As: Do you enjoy your job? Are you going out tonight?
 - With YES or NO question you do not allow the respondents to give you real feedback (as I am considering it and .
 - Google for professional questionnaires and consider using the same questions or slight modifications.

Other sources of information

Examples of Likert scale (<https://www.questionpro.com/blog/likert-scale-examples/>)

Representativeness

https://forscenter.ch/wp-content/uploads/2021/12/forsguides_representativity_v18_final_sub_v03_combined.pdf

Common errors in surveys

<https://www.surveymonkey.com/curiosity/double-barrel-survey-question/>

Interviews (individual or group)

What answers they will give

Interviews, also known as in-depth interviews, are **the main part of qualitative approach**. **They do not provide us with numbers (usually it makes no chance to run statistical analyses)**, but with longer speeches/texts on the desired topics. You should be very careful with the choice of respondents, they really should have a good insight/experience with your topic.

How to use them

In most cases, the situation is one on one, ideally face to face, albeit these days in less sensitive topics, online (telephone) interviews can be considered. Always use a prepared set of questions (**scenario for**



the interview), so that you do not forget about anything. It is not a questionnaire, you can use different wordings of the same questions, you can change order. Conducting a good interview is a form of art that eludes standardization. As always, remember, that participation in research is a good will of the respondent. Be polite and do not push. Respect the privacy of your informant.

Conduction a group interview is also an option. The most advanced form of a group interview is a focus groups interview. This is a very complex technique based on technical and psychological resources. If you go this way, please refer to a professional.

A less problematic form is a group interview. However, even when the group is between 5 and 10 (this should be the limit), you must be very careful to let everybody speak their main, yet on the other hand not to push other and convince them. It can be very hard to control for group dynamics.

What to be careful about

First and foremost in the case of interviews, it is trust. You should have your respondent sign an informed consent, you should offer – and grant anonymity. If you want to record that interview, this should be clearly indicated and agree on.

Then, focus on your research topic. This really depends on your research design. Sometimes, a very loose and long narration can be what you are going for. Yet, in most cases, you are there to get specific answers to specific questions – and you should be able to get them, the nice way. Also, if you need to work with word-to-word transcription, the more talk there is, the more work you have, make it worthy. Rule of thumb these days? Offline interview – the limit is 40-45 minutes, online 20-25. But given the nature of topic and respondent, this could vary.

Other sources of information

Tips for better interviews

<https://www.cfrinc.net/cfrblog/four-actionable-tips-to-improve-your-in-depth-interviews>

Designing interviews

https://nyhealthfoundation.org/wp-content/uploads/2019/02/m_e_tool_series_indepth_interviews-1.pdf

Common errors when conducting interviews

https://www.sjsu.edu/faculty/weinstein.agrawal/urbp298_phl_handout_Interviews.pdf

Tips for group interviews

<https://www.themuse.com/advice/16-quick-tips-thatll-help-you-stand-out-in-a-group-interview>

Observation

What answers they will give

These day this technique is less and less applied, however you can find yourselves in a situation that calls for this. It may seem as an easy one, however, there are some decisions to be made and thing you need to control.

First, is it a situation where you need to inform the other about your presence as a researcher? It will interfere in the situation, however it is ethical and in some cases hard to avoid. For example, living in



a group of homeless people. On the other hand, you may go and do observation during a football match. There is no bigger need to “uncover” yourself.

How to use them

In this technique, the focus is everything. **Do not go into the field unprepared** – do all possible research and make related decisions at home, there will most likely be no time for that in the field. Also, decide on how you are going to store your observation – recordings, field notes...

Most importantly, decide over what you need and need not to observe. Some things can be asking for your attention, yet have no benefit to your research agenda.

What to be careful about

This depends on your research goals and resources, but you should **have a higher number of instances that you observe**. But, be careful with the choice, because then another pitfall comes into play – hidden/unexpected factors. Especially, if you plan observation over a longer timespan (e.g. one season of football matches and behavior of the fans), many things can interfere. For example, there can be a change in police presence (driven by a rising conflict), the fans can change (a court decision over “fan crimes”).

Other sources of information

General tips on observation

<https://www.studysmarter.us/explanations/social-studies/theories-and-methods/observation/>

Step by step observation

<https://www.sociologygroup.com/observational-research/>

Observation examples

<https://revisesociology.com/2017/06/30/participant-observation-sociology-recent-examples-research-studies/>

Case Studies

What answers they will give

The goal here is to **understand thoroughly** one (monography) or more cases. Usually this is combination of several techniques. If you want to understand let us say an impact of policy change in a given school (e.g. introducing uniforms), you should combine desktop research, interviews and even partially a small survey. The idea is to present your research topic in all its depth and variety, to include as much perspectives and views as possible.

How to use them

The main condition and decision is to have your case clearly defined. You should also have some **strategy how to obtain data** – will the examined organization give it to you, are the people willing to participate? You could, if possible, also go for more than one case study and to compare between them, if possible.

What to be careful about

Three things are critical:

- Data availability
- Access to different views on the case
- Clearly defined time frame



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Other sources of information

General info on case studies

<https://explorable.com/case-study-research-design>

Case study guide

https://library.unimelb.edu.au/_data/assets/pdf_file/0011/1924175/Casestudy_Research.pdf

Errors when conducting case study

<https://arxiv.org/ftp/arxiv/papers/1304/1304.1186.pdf>

(SUMMARY) Take into the class (Summary of the field research methods to be elaborated later):



1.5. Designing research – steps to design own research

1.5.1. Research phases

First look at general phases of the research (the steps in which is the research conducted):

Preresearch phase - orientation in the issue and problem definition

This phase would not be mentioned by classical research approach as the research is standardly designed within **specific scientific field with specific topics, methods and approaches** (see the chapter How to explore an issue (the steps) above). In this sense researchers often start in the phase of the research design – formulating criteria/hypothesis (see below).

It is actually quite interesting that (many) research that is done (see the scientific papers to confront it yourself) actually **does not have formulated research questions** – in the meaning what phenomena do we want to understand) And if “research questions” are formulated these are actually concrete criteria and hypothesis not a question concerning the issue but particular already selected aspect (**selected criteria to be tested by the research**). So in this sense if we want to understand something it is up to us to put together outcomes of different research to answer a question concerning the topic.

In our case, the **ACTIVE approach**, we would like to encourage to start with **problematizing the problem definition itself**. This is also important as we are dealing with students from secondary level of education with no specific scientific field behind them. So they should also start with actually orient themselves in the concerned topic. As we would rather call as selected issue (which can have more topics in it).

In this phase we actually orient in the issue itself to see what is it about and what is and what is not important. In the terminology of the Design thinking it is the **Divergent phase** (see above). The goal is to collect information to see/understand **what choices we actually have** and what are the possible and relevant approaches, perspectives, opinions, actors concerning the issue. So it is like **making the overall picture to understand the issue**.

We can ask questions as:

- What is important?
- What are the relevant actors?
- What are the opposing narratives, perspectives and opinions?
- What topics should be covered (explained) to get relevant picture about the issue?
- What problems to solve? How are these problems perceived by different actors?

Note that most of these questions actually had been part of the **Activity 2**. So it is expected to build on this findings when designing the research. The activities done as part of the Activity 1 and 2 are actually desk research part of the research (of course they might need to be extended further).

Formulating goals (aims) of the research

As the research itself will be (by its essence) focused (we will look for something – look for prove, evidence, patterns...). We need to at first know what we want/need to find out to understand the issue (topics concerned, actors, differing perspectives and opinions...).



Problem is understood in broad sense as **something that should be/need to be solved for some purpose** (avoid harm, find solution, understand causes or impact of something etc.). Need to do something or need to know/understand something. In narrow perspective the problem is understood as something that is perceived as not wanted (something that should be avoided).

The “**problem**” represents the main **aim of the research**. As: we might want to find what are the solutions for something...(e.g. climate change); what are causes of something...; what are impacts of something...

The aim of the research should be feasible for the students and in scope that can be grasped. See in the example below with broad research question like: *What are causes of climate change?* Such a question is actually very broad and not every aspects could be covered. But it still would make sense to research and put together all the known causes of climate change without going too deep about the individual causes. Or on the other hand we could choose selected topic(s) and research deeper about them. We would recommend to **give a choice to students to choose what are they interested – to go more deep about one specific topic or to grasp wide topic from different perspectives**) The class could also be (as the best solution) divided and some students could work on overall picture and some on details.

The “**problem**” we want to explore need to be **conceptualized in the form of research questions**. The **purpose of research questions** is actually (or should be) to grasp/tackle relevant aspects of the problem we want to solve.

Research questions might in general be asked about:

- Measure of things (how much, how many)
 - leads to quantitative research design looking for measurement (relative - percentage of something or absolute - quantity of something)
 - difference – is there a statistically and substantially relevant difference between two sets of cases (e. g. do men in given population have higher salaries than women?)
 - for testing hypothesis (set criteria) (as part of deductive approach) or for finding patterns (important aspects) (as part of inductive approach)
 - outcomes are numbers and statistics
 - describes characteristics, averages, patterns
 - relationship between characteristics/aspects (like correlation)
- Explanation of things (why...someone does what he does)
 - leads to qualitative research design looking for in-depth understanding of underlying reasons, opinions, experiences and motivations
 - outcome are words/statements and explanations
 - understand subjective or group experiences, motivations, needs, objective
 - possible to explain findings from quantitative research (part of deductive approach) or for formulating new hypothesis (part of inductive approach)

So as for example if we want to find solutions for impacts of climate change (the problem/aim) we should ask questions like as:

What are the causes for climate changes?

What are the impacts of climate change? (here could be many subquestions concerning different aspects of society and nature)



What are the possible actions to tackle causes and impacts of climate change (mitigation measures)?

What impact these solutions will have on the climate/different actors in society/nature...?

What are the possible actions to tackle impacts of climate change (adaptation measures)?

To what extent these solutions will help to tackle climate change (effectiveness of these actions)?

To what extent these solutions are efficient to tackle climate change?

...and surely many more...

From this example we can see that to “solve a problem” we usually need to answer more questions to really grasp the problem from the **relevant perspectives**. The above questions are still very broad and it would be better to focus the research questions into more detailed subquestions. And possibly (according to our aim) to narrow the research to one of the above topic or to tackle the problem from the broad/overall perspective without going in to details.

The key question for formulating the research questions would be:

What are the relevant aspects of the problem we need to know to solve the problem?

Preparation phase (research design)

Someone might consider the aims of the research as part of the research design, to some extent it is also possible, but we would rather (but not strictly) understand **research design as strategy to reach the aims of the research** = **strategy to find answers to research questions**. In this context, strategy means a plan to use various resources over given time.

Hypothesis **assumption to be tested** during the research. It could be formulated based on some theory or previous findings. Hypothesis should have **relevance to the research question(s)**. Notice that many seemingly “exploratory” questions could be also formulated as hypothesis. Like if you ask whether an action taken is effective you can understand it actually as testing a hypothesis about effectiveness of the action (hypothesis = the action is effective).

Research design should define following aspect of the research:

- Define **criteria** by which we will judge reaching the aims of research questions
 - The aim of the criteria is to define concrete aspects and hypothesis that we need to find out or to be assessed so we can answer the research question
 - The criteria could be in a form of **concrete hypothesis** to be tested OR in could be **exploratory** (identifying relevant aspects of something)
- Choosing the **methods** to be used to fulfil/answer the defined criteria
 - First choose whether you will do (need to do/can do) field research to get primary data or will just use secondary data based on desk research
 - What data and information we can get by other sources (desk research)?
 - For what we will have to do a field research?
 - Consider time and resources available
 - Choose quantitative or qualitative approach (or combination)
 - See the methods described above to decide which and how to use it
- Identify **sources of information and data** for the desk research
- Choosing the **target groups** for the field research methods



- Who are going to be the respondents of the survey, interviews or participants of group interview...?
- It is good to go into details of exactly :
 - who is going to be target group (e.g. company might be a target group but not a respondent, you have to define who will be approached as a representative of the company: CEO, manager, employee, HR... / the same with schools, and also thing who is actually the target group school or rather students, director, teachers, cooks are)
 - how many respondents we will have
 - how they will be approached (where we get contacts and means of
- Crucial is to define relevant structure of the groups (see above about quantitative research) without relevant representation the research will be not conclusive
- Setting up the **time schedule** for the research
 - Set a time plan for the desk and the field research
 - Research should be planed for every step so we know what will be followed by what
 - Recommended is to use Gantt chart (it can be quite easy in XLS, see Activity 3 materials)
 - go into details e.g. when will the survey start and how long will have the respondents time for the answers

Preparation of the research realization

In this phase the main activities include:

- Collecting the documents, data sets etc. for the desk research
- Preparation for the field research:
 - designing the questionnaires for surveys and interviews
 - remember the research criteria
 - concrete structure (topics of the questionnaire: what we need to know x not what all can we know)
 - formulating the questions
 - setting the scales (for surveys)
 - program the survey questionnaire if planned to be done on-line
 - getting the contact information to be able to reach the respondents
 - So called piloting – using your research method on a small sample, reflecting on it and making changes if necessary (e.g. you find out that some questions are misunderstood)
 - preparing for the realization of the survey and interviews

Realization phase

Realization of the desk research and field research.

See details how to conduct individual method above.

Analytical phase and the conclusions



In this phase all the data and information gathered through research are analyzed and/or synthesis approach is done. The main goal is to assess the research criteria and answer the research questions.

In quantitative research statistical analysis is performed and interpreted. For qualitative research the gathered information is analyzed and findings are formulated. Once again, plan ahead – different statistical software has various needs for data standards and option of data analysis. You should shape our data according to it.

For details see Module 4 Making sense of information

1.5.2. What to consider in research design

Check list to control when preparing and conducting research:

- ✓ The **research questions** are relevant to our aim of the research (answering them will lead to finding what we need to know)
 - relevant aspects of the issue were considered
 - consider main aspects that might influence our decisions based on the research
- ✓ The **research criteria** will enable us to answer the research questions
- ✓ The **methods** chosen will enable us to assess the research criteria
- ✓ Time and **resources** available were considered
- ✓ Relevant **groups** are approached by the research (without relevant representation the research will be not conclusive and reliable for decision making and we should be careful about the interpretation of the findings)
- ✓ The **target groups** for the field research are reachable to us (we know how to reach them)
- ✓ **Questions** for the interviews and surveys are needed and connected to the research criteria
- ✓ **Legal standards** of research such as informed consent and GDPR rules if needed



1.5.3. Research design example

Example research design to solve research question: *What are the impacts of climate change?*

PS: the following is just an examples and as such not complete. We can by this example also see that if the research question is to broad than there are (to many) ways how to approach it. It will better to formulate more subquestions to cover this topic or narrow the topic itself. But on the other hand there would be nothing wrong to pose broad but relevant question where the aim would not be to go deep in to it but to identify only the “main aspects”.

Research design:

Criteria	Explanation of criteria	Method	Target group/source of information	Specification of target group	Source of contact
Rising temperature	Hypothesis to be tested: the temperature is rising	Desk research Statistical analysis	Statistics about the world temperature (NASA) <i>+other sources</i>	<i>+other relevant sources to be found</i>	Data set on available on website...
Climate change has different impact for different regions	Hypothesis to be tested: The temperature rising is different in different regions	Desk research Statistical analysis	Statistics about the world temperature (NASA) <i>+other sources</i>	<i>+other relevant sources to be found</i>	Data set on available on website...
	Different impacts identified	Desk research Systemic review	Scientific journals IPPC report News reports	IPPC report Relevant articles to be found	internet
Impact on businesses	Climate change has impact on businesses	Desk research	IPPC report News reports <i>+other sources</i>	<i>+other relevant sources to be found</i>	internet
Impact on local businesses	Climate change has impact on local businesses	Survey	All business organizations in our town	Identified by address in registry of business	Registry is available on-line. The contacts from the company’s web pages
		Interviews	10 business organizations in our town covering different categories	Representation of SME and large companies and main categories of business (depending on the structure in town)	The contacts from the company’s web pages CEO of the company (or someone appointed by company to talk with us)
....



The research design should then involve time table for the above research. Best for example in the form of an easy Gantt chart:

Gantt chart			Week										
Activity	Steps	Done till	1	2	3	4	5	6	7	8	9	10	11
Desk research	finding relevant sources	xx.xx.xxxx											
	analysing information	xx.xx.xxxx											
	conclusions - output	xx.xx.xxxx				x							
Survey business organizations	design the questionnaire (World version)	xx.xx.xxxx					x						
	comments by other students												
	programing the on-line questionnaire	xx.xx.xxxx						x					
	getting the contact information	xx.xx.xxxx						x					
	realization of survey	xx.xx.xxxx											
	analysing the results - output	xx.xx.xxxx									x		
Interviews 10 business organizations	xx.xx.xxxx										x	
	...	xx.xx.xxxx											x