RESEARCH-
AN INTRODUCTION

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AGENDA

- What is research?
  - Criteria for research
  - Types of research
  - Research process
- Framework For Research
  - Philosophical Views
  - Research Designs
  - Research Methods
- In Class Exercise (Deadline: 20th September)

WHAT IS RESEARCH?

WHAT IS RESEARCH?

- "The **systematic** investigation and study of materials and sources in order to **establish facts** and **reach new conclusions**." (Oxford Dictionary)

- "Research is a **systematic** inquiry to **describe**, **explain**, **predict** and **control** the observed phenomenon. Research involves **inductive** and **deductive** methods" (Babbie, 1998).

Any idea ?????

What are Deductive & Inductive methods ????

WHAT IS RESEARCH?

- *Deductive is to test the validity of the explanations.*
- *Inductive is to develop explanations*

CRITERIA FOR RESEARCH ACTIVITY, (OECD, 2015)

- Novel/ **New**
  - New knowledge, an extension, , new setting
- Creative
  - Not mundane
- Uncertain
  - unknown
- Systematic
- Transferrable/Reproducible

TYPES OF RESEARCH (DAWSON, 2009)

- Field
  - enables groups of researchers with similar interests to be identified
- Approach
  - represents the research methods employed as part of the research process
- Nature
  - type of contribution that research makes to knowledge depends upon its nature

TYPES OF RESEARCH (DAWSON, 2009)

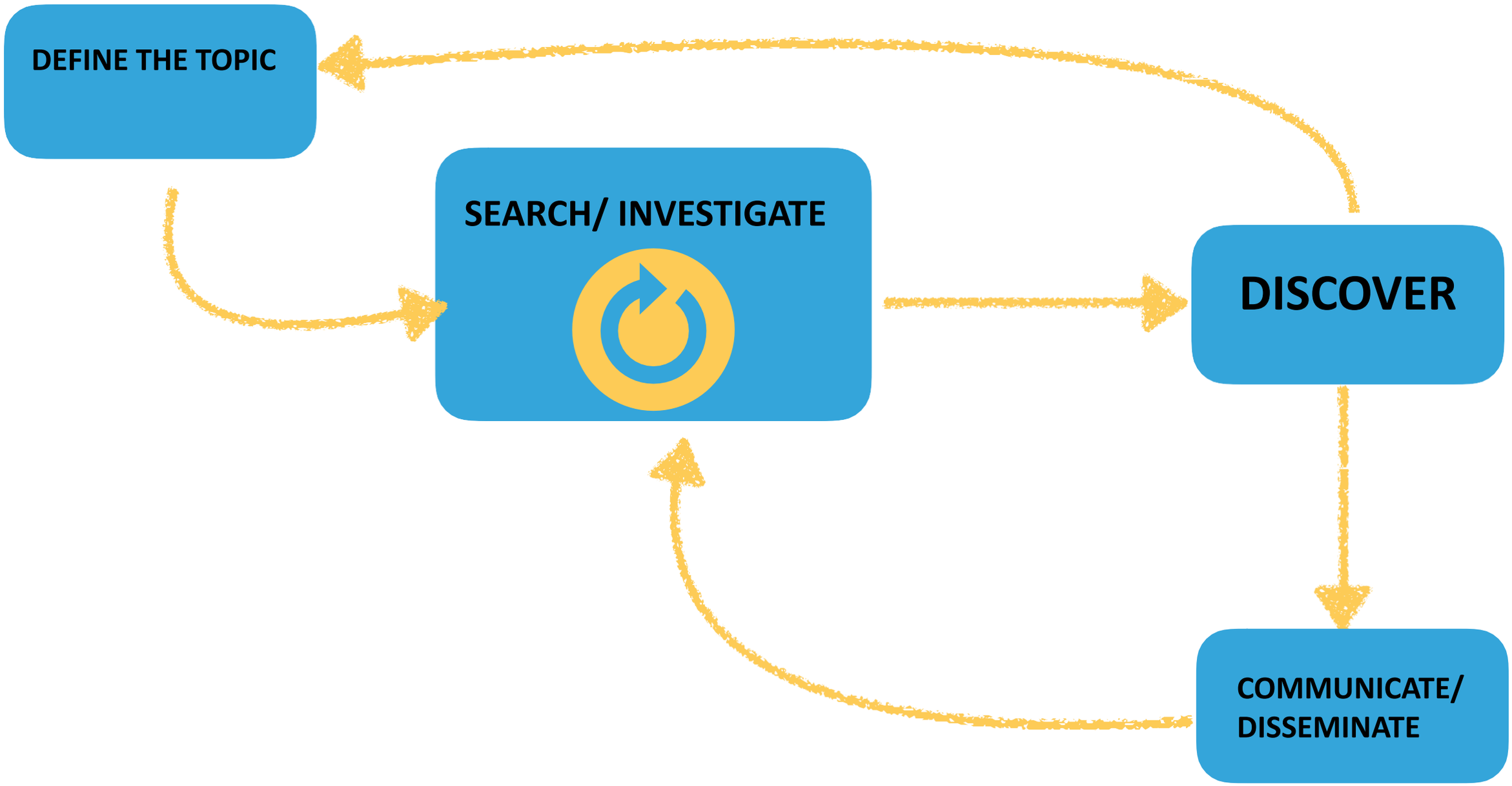
- Field
  - Information System
  - Software Engineering
  - Computer Science

- Approach
  - Qualitative
  - Quantitative
  - Mixed

- Nature
  - Theoretical
  - Descriptive
  - Exploratory
  - .....

RESEARCH PROCESS

RESEARCH PROCESS



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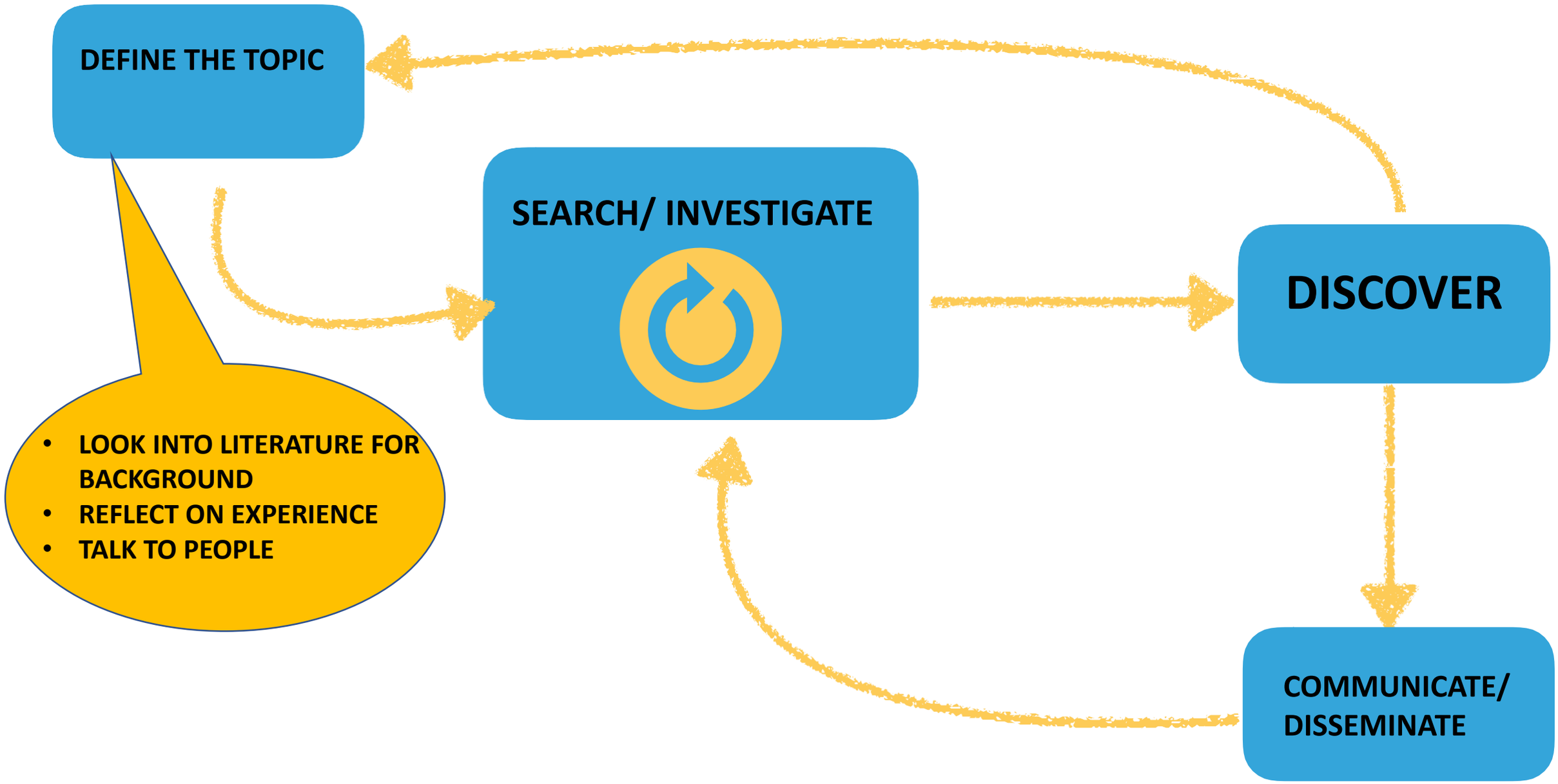

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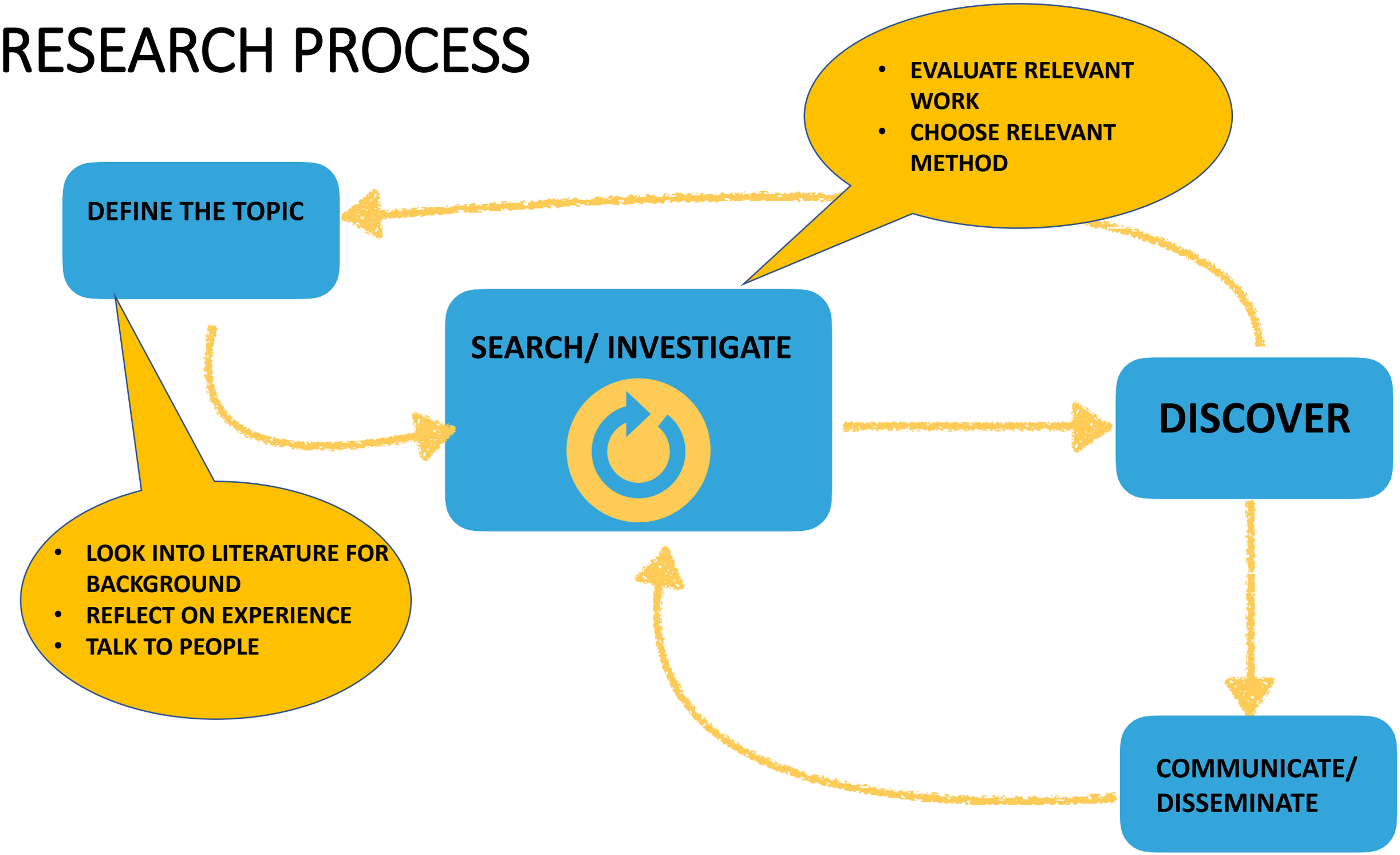

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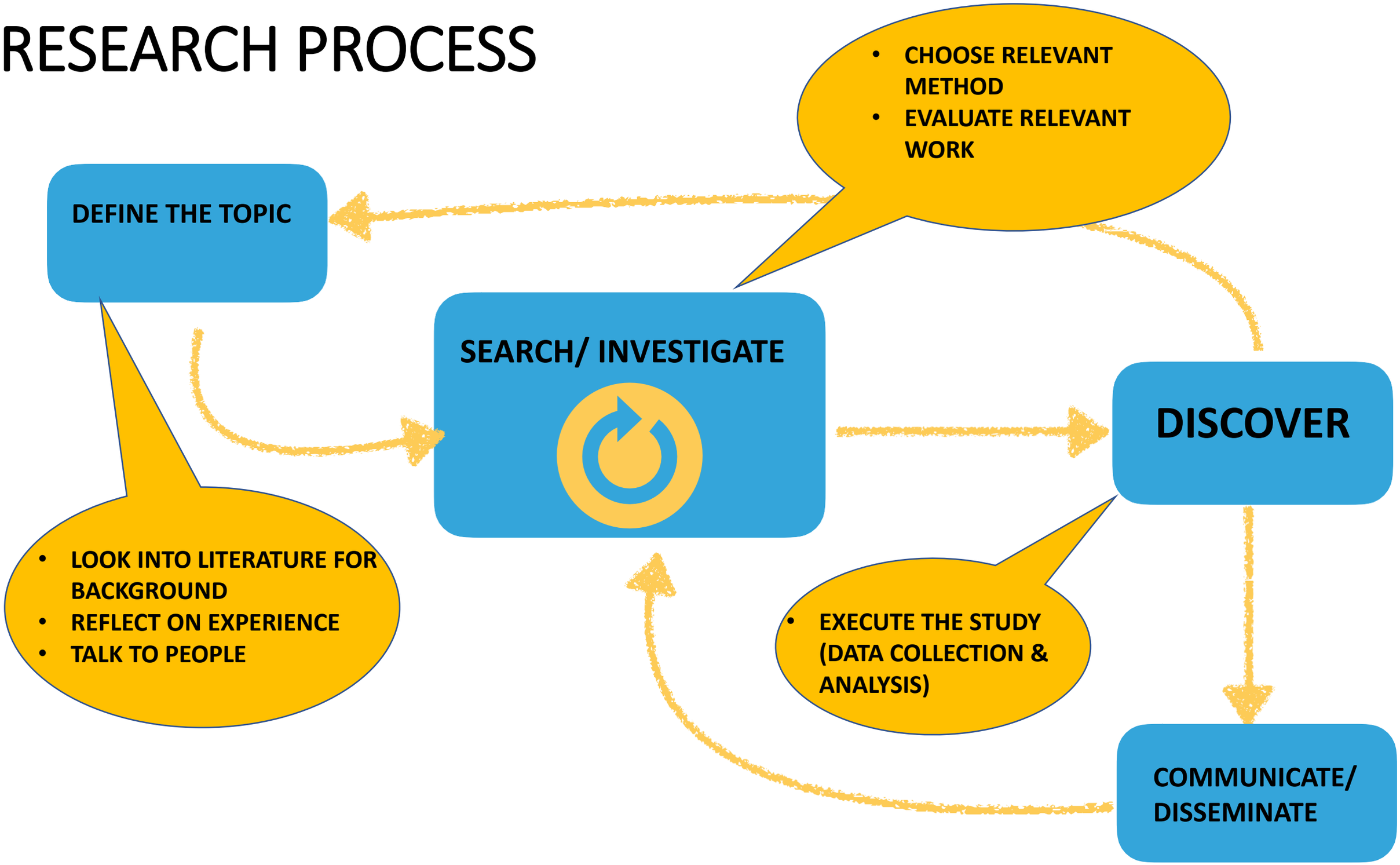

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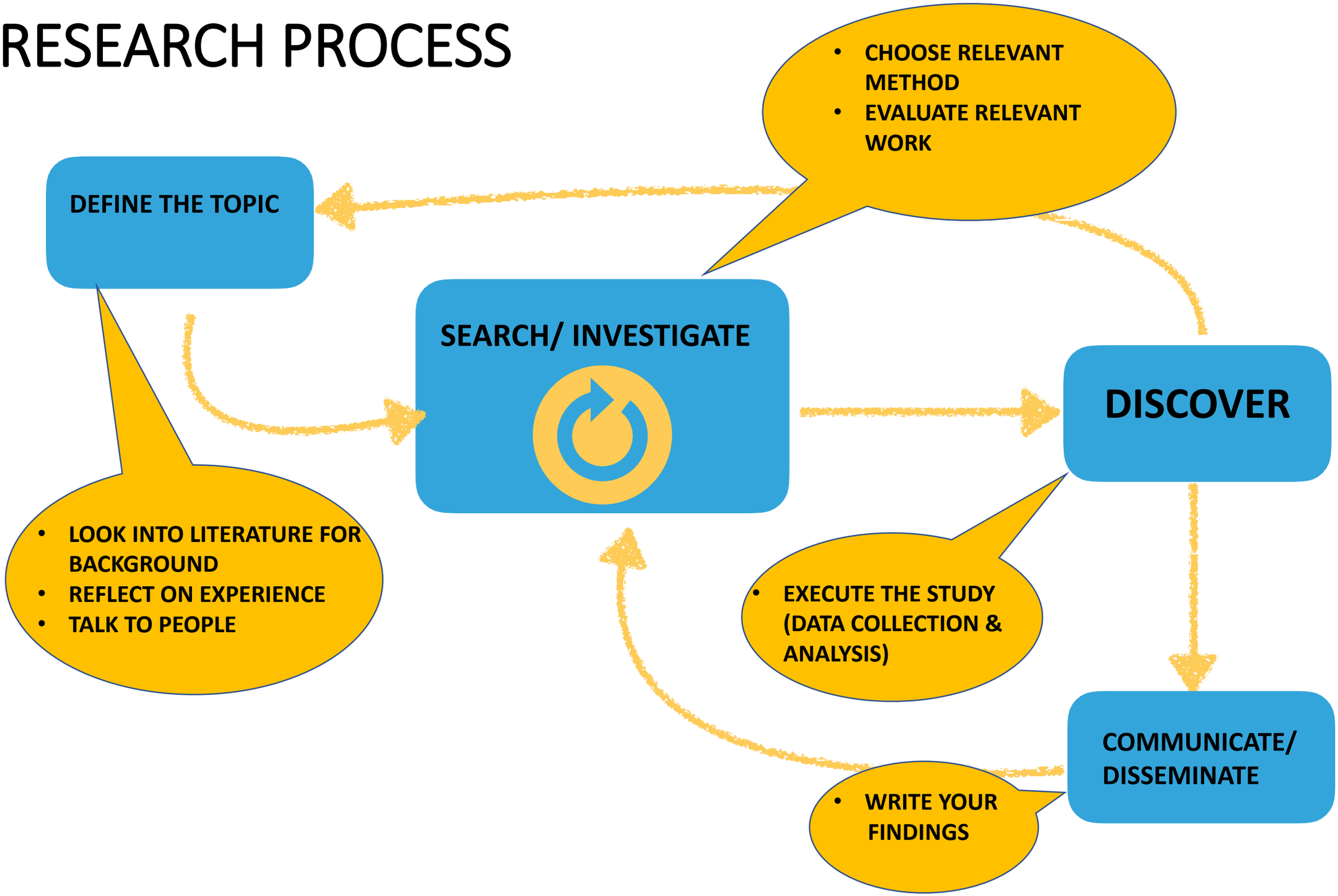

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FRAMEWORK FOR RESEARCH

OVERVIEW

Philosophical Worldviews

Positivism
Constructivism
Transformative
Pragmatic

Research Design

Quantitative
Qualitative
Mixed Methods

Research Methods

Questions/Hypotheses
Data Collection
Data Analysis
Interpretation
Validation

Source: Creswell and Creswell (2018) Research Design: Qualitative, Quantitative and Mixed Methods Approaches, 5ed, Sage Publishing

PHILOSOPHICAL WORLDVIEW

Plato (428 BC - 383 BC)

- According to Plato, knowledge is "justified true belief"
- To know something, you must believe it to be true, and have a clear justification for believing it to be true.

Source: Easterbrook et al.(2008)

PHILOSOPHICAL WORLDVIEW

- Why is it important to discuss?
  - Support your argument why you choose the specific approach and methods to conduct your research.

Break (10 min)

WHAT DO YOU SEE?

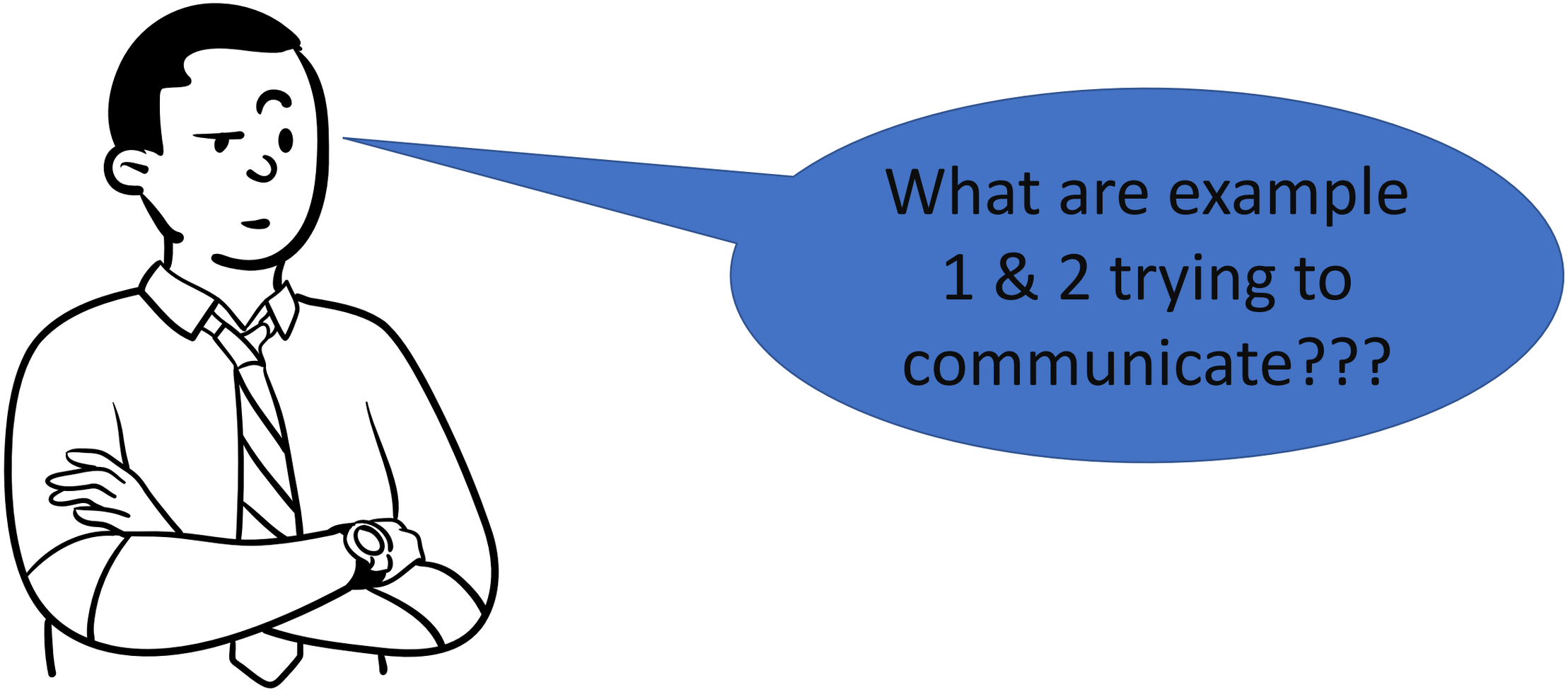
EXAMPLE 1

Helen is a master student in software engineering study program, and she has two supervisors. Her topic is related to understanding the **efficiency of Test-driven Development (TDD)**. Supervisor A suggests that she should run an experiment, so she can conclusively (under controlled environment) measure the effect of TDD (compared to Test-last development) on the time to complete coding tasks and number of correct tasks. Supervisor B disagrees, he suggests that Helen should observe and interview developers in industry who are doing TDD. He thinks the efficiency of TDD has a lot to do with the individual developers experience and skills, and also the contexts that the developers work in (type of software being developed, organisation culture, tools, etc.).

Adapted from: Easterbrook et al. (2008)

EXAMPLE 2

Peter is a master student in Learning Experience and Game Development study program, and he has two supervisors. His topic is related to examining the **effects of gamification in education**. Supervisor A suggests that he should run an experiment, so he can conclusively (under controlled environment) measure the effect of gamification (compared to Traditional/Conventional approach) on students' learning (grades), and engagement (number of logins) etc. Supervisor B disagrees, he suggests that Peter should interview educators who are using gamification in their teaching and the students. He thinks, a big effort is required in the design and implementation of gamification for it to be fully motivating for the students. Therefore, the effectiveness of gamification is influenced by the individual educator's experience and skills, personality traits of the students, and also the educational contexts, the gamification is applied in (type of course, mode of teaching, tools, etc.).


What are example 1 & 2 trying to communicate???

EXAMPLE 1

Helen is a master student in software engineering study program, and she has two supervisors. Her topic is related to understanding the efficiency of Test-driven Development (TDD). Supervisor A suggests that she should run an experiment where she can conclusively (under environment) measure the (compared to Test-last) time to complete a task, number of correct tasks etc. Supervisor B suggests that Helen should do an interview development teams doing TDD. He thinks the effectiveness of TDD has a lot to do with the individual developers experience and skills, and also the contexts that the developers work in (type of software being developed, organisation culture, tools, etc.).

EXAMPLE 2

Peter is a master student in Learning Experience and Game Development study program, and he has two supervisors. His topic is related to examining the effects of gamification in education. Supervisor A suggests that he should run an experiment where he can conclusively (under environment) measure the (compared to time on students' engagement etc. Supervisor B suggests that Peter should do an interview study with educators who are using gamification in their teaching. He thinks the effectiveness of gamification has a lot to do with the individual educator's experience and skills, and also the educational contexts, the gamification is applied in (type of course, mode of teaching, tools, etc.).

One thesis, Two ways of doing it !!!!

EXAMPLE

One thesis, Two ways of doing it !!!!

But how come?

Helen is a ... dent in Learning engineering s... evelopment study two supervis... o supervisors. His understanding ... ning the effects of Deve... visor A that ... un an can ... (under envi... re the (com... ed to time... udents' of c... nt etc. sugg... sts that inter... who are doing ... ning. He has a lot to do with the individual developers experience and skills, and also the contexts that the developers work in (type of software being developed, organisation culture, tools,etc.).

... thinks the effectiveness of gamification has a lot to do with the individual educator's experience and skills, and also the educational contexts, the gamification is applied in (type of course, mode of teaching, tools, etc.).

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Constructivism
Transformative
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POSITIVISM/POST POSITIVISM

- The assumptions of positivism represents the traditional form of research.
- More prevalent in quantitative research.
- Also called the scientific method or doing science research
- Start with a theory and test it.
- Positivist are reductionist
- Objectivity is key. Possible researcher's bias must be examined.
- There is no absolute truth. Positivists tend to say they do not prove a hypothesis rather than say fail to reject a hypothesis.

CONSTRUCTIVISM

- Knowledge cannot be separated from its human contexts (experience and environment).
- More prevalent in qualitative research.
- Less focus on testing theories, but more on understanding how people make sense of the world.
- Theory may emerge (inductive) but tied to the contexts.
- Research findings is an interpretation shaped by the researcher's own experience and background.

TRANSFORMATIVE

- Emerged from a political movement to represent and improve conditions for minorities, e.g., feminist studies. The general laws and theories from positivists do not fit marginalised individuals.
- Transformative worldview believe that research needs to be intertwined with making changes in the real world.

https://dg.dk/wp-content/uploads/2019/11/TRANSFORMATIVE-RESEARCH-NY-pdfUA.pdf
https://ieeexplore-ieee-org.proxy1-bib.sdu.dk/stamp/stamp.jsp?tp=&arnumber=6729513

PRAGMATIC

- Acknowledge that knowledge is incomplete
- Knowledge has a degree of relativism - what is useful for me is not necessarily useful for you.
- Instead of focusing on methods, researchers emphasize the research problem and use all approaches available to understand the problem
- Pragmatist use whatever methods that would work, usually mixed methods.

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RESEARCH DESIGN

RESEARCH DESIGN

- Quantitative research
  - “An approach for testing objective theories by examining relationships between variables” (Creswell and Creswell, 2018)
- Qualitative research
  - “An approach for exploring and understanding the meaning individuals ascribe to a social problem” (Creswell and Creswell, 2018)
- Mixed methods
  - An integration of the two

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PHILOSOPHICAL WORLDVIEW AND RESEARCH DESIGN

	Qualitative	Quantitative	Mixed
Philosophical View	Constructivist/ transformative	Positivist	Pragmatic

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RESEARCH METHODS

PHILOSOPHICAL WORLDVIEW, RESEARCH DESIGN AND RESEARCH METHOD

	Qualitative	Quantitative	Mixed
Philosophical View	Constructivist/ transformative	Positivist	Pragmatic
Strategy of inquiry	ethnography, exploratory case study, (qualitative) survey, interviews etc….	Survey, experiments etc	Convergent parallel Explanatory sequential Exploratory sequential
Methods	Open-ended question, text or image data, flexible inquiry	Close-ended question, numeric data, pre-determined	Both open and close ended questions, text and numeric data

Modified from Table 1.4 in (Creswell and Creswell, 2018)

PHILOSOPHICAL WORLDVIEW, RESEARCH DESIGN AND RESEARCH METHOD

	Qualitative	Quantitative	Mixed
Practices used	▪ Validates accuracy of the data (triangulate) ▪ Makes interpretation of the data ▪ Collaborate with the participants ▪ Study the contexts or setting of the participants ▪ Brings personal value into the study	▪ Test or verifies theories ▪ Identify variables to study ▪ Relates variables in questions or hypotheses ▪ Uses unbiased approaches ▪ Use statistical procedures	▪ Collects both quantitative and qualitative data ▪ Integrates data at different stages of inquiry

Modified from Table 1.4 in Creswell and Creswell (2018)

Mini Quiz ☺

1. Postpositive research is also known as the scientific method.

❑True
❑False

2. Which of the following is the main focus of constructivism?

❑participant's views of a situation
❑determining proper research methods
❑finding the truth
❑cause and effect

3. A researcher's background, ideas, and experiences become central to the research process in both qualitative and quantitative research.

❑True
❑False

Mini Quiz ☺

4. Qualitative research develops theory, while quantitative research tests theory.

❑True
❑False

5. Sarah is conducting research to examine whether a computer-based intervention improves functioning among individuals with autism. What type of design is she most likely using?

❑grounded theory
❑explanatory sequential mixed methods
❑survey research
❑experimental research

6. Mixed methods research relies on what type of methods?

❑multiple forms of qualitative and quantitative data
❑multiple forms of qualitative data
❑multiple forms of quantitative data
❑mixture models of statistical analysis

EXERCISE

EXAMPLE 1 (For SE Students)

Helen is a master student in software engineering study program, and she has two supervisors. Her topic is related to understanding the efficiency of Test-driven Development (TDD). Supervisor A suggests that she should run an experiment, so she can conclusively (under controlled environment) measure the effect of TDD (compared to Test-last development) on the time to complete coding tasks and number of correct tasks. Supervisor B disagrees, he suggests that Helen should observe and interview developers in industry who are doing TDD. He thinks the efficiency of TDD has a lot to do with the individual developers experience and skills, and also the contexts that the developers work in (type of software being developed, organisation culture, tools, etc.).

Adapted from: Easterbrook et al. (2008)

EXERCISE

EXAMPLE 2 (For LE & GD Students)

Peter is a master student in Learning Experience and Game Development study program, and he has two supervisors. His topic is related to examining the effects of gamification in education. Supervisor A suggests that he should run an experiment, so he can conclusively (under controlled environment) measure the effect of gamification (compared to Traditional/Conventional approach) on students' learning (grades), and engagement (number of logins) etc. Supervisor B disagrees, he suggests that Peter should interview educators who are using gamification in their teaching and the students. He thinks, a big effort is required in the design and implementation of gamification for it to be fully motivating for the students. Therefore, the effectiveness of gamification is influenced by the individual educator's experience and skills, personality traits of the students, and also the educational contexts, the gamification is applied in (type of course, mode of teaching, tools, etc.).

IN CLASS EXERCISE

- In a group of 5-6, discuss the following from the example shown:
  - Which supervisor has which worldview? And how you came to that conclusion? Relate with characteristics mentioned in the lecture/book!
  - Is there a better approach for Helen/Peter? If yes, why? If no, why?
  - If it was up to you, how would you approach Helen's/Peter's thesis topic? Discuss in terms of philosophical worldview, research approach, possible methods, and practices used?

REFERENCES

- Babbie, R. (1998), *Basics of Social Research,* Thomson Learning.
- Creswell and Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, Sage Publishing.
- Robson C (2011) Real World Research. John Wiley & Sons, (2nd edition)
- Runeson, P., Host, M., Rainer, A., & Regnell, B. (2012). Case study research in software engineering: Guidelines and examples. John Wiley & Sons.
- Easterbrook S., Singer J., Storey MA., Damian D. (2008) Selecting Empirical Methods for Software Engineering Research. In: Shull F., Singer J., Sjøberg D.I.K. (eds) Guide to Advanced Empirical Software Engineering. Springer, London. ((Available from SDU's library as an e-book)