# ACTION RESEARCH TOOLKIT

## TEACHER'S GUIDE

**First Edition**

Published by
**BEST**
Basic Education Sector Transformation

Unit 14D, 14th Floor,
Marco Polo Business Office,
Sapphire Road, Ortigas,
Pasig City 1605 Philippines
www.best.org.ph

**Action Research Toolkit**
*Teacher's Guide*

This guidebook was published with support from the Australian Government through the Basic Education Sector Transformation (BEST) Program.



Printed in the Philippines
First Printing, 2019

**Lead Offices:**
Ms. Mariel C. Bayangos
*Chief, Policy, Research, and Development Division*
Dr. Rosalina J. Villaneza
*Chief, Bureau of Learning Delivery- Teaching and Learning Division*

**Contributors:**
Julieven R. Abrea, Jason V. Ang, Delfa C. Aponesto, Jeoffrey L. Bernabe, Jaeriel R. Bersamina, Rex C. Briones, Ramel P. Cael, Mauricio M. Catan, Pedro Jose C. Cudal, Rita R. Dimakiling, Beth Catherine M. Dongon, Charlie O. Fababaer, Nepomuceno B. Federizo, Joel P. Feliciano, Mark Lito B. Gallano, Caroline L. Guerta, Fatima Migñon D. Guia, Dae P. Habalo, Erdenan S. Labrador, Alea Ann F. Macam, Crisalyn D. Miraato, Ana Belen S. Muring, Anna Mylene F. Natividad, Maria Laarni Carla C. Parinis, Arnel L. Poja, Warren A. Ramos, Jumar M. Sadsad, John Brian S. Salvana, Vicente G. San Miguel, Emiljohn C. Sentillas, Karla S. Sio, Ma. Gina D. Surles, , Jayson B. Ubina, Sarah Jane A. Valdez, Jayvy C. Vegafria, Nona B. Verina, Elvin H. Wenceslao

**Technical Consultant:**
Dr. Fe' Josefa G. Nava

Australian Aid

DepED
DEPARTMENT OF EDUCATION

SESSION 1.0

# ACTION RESEARCH DEFINED

# OBJECTIVES

At the end of this section, the reader will be able to:

1. describe Action Research in the context of teaching-learning;
2. identify the five basic steps that operationalize the Action Research framework; and
3. cite the importance of Review of Literature in formulating an intervention for Action Research.

# INTRODUCTION

Before we proceed to the activities in the actual conduct of Action Research, it is essential to understand what it is.

In this section, you will know what makes Action Research different from Basic and Applied Research. You will also be reviewing the five steps in doing Action Research as discussed in the previous LAC session. You will see how the five steps of Action Research are connected to the Review of Literature.

# STEPS/KEY CONCEPTS

## DEFINING ACTION RESEARCH

Teachers often face many challenges inside the classroom and in school. Some of these need to be addressed right away; otherwise much of the teaching and learning process will be ineffective. Such problems or issues can be resolved through Action Research.

Action Research is, by definition of the Department of Education, a process of *systematic* and *reflective inquiry* that aims to *improve* educational practices or *resolve* problems in the classroom or in the school (DepEd Order No. 16, s. 2017). It is a process of *uncovering* solutions to classroom or school problems through a series of methodical, logical, and organized activities. The outcome of these activities is the enhancement of classroom and school practices.

Without realizing it, you, as a teacher, engage in trying to find solutions and solving classroom problems every day. What makes Action Research different from mere solving classroom of problems is that in it, we start with a research question. When we, as researchers, conduct a study, we proceed through a distinct set of steps. The next pages provide a discussion on the Action Research process.

## OPERATIONALIZING THE ACTION RESEARCH FRAMEWORK

The Action Research framework discussed in Session 2.1 can be operationalized in the following five (5) steps.

### 1 Identify a research problem

- Specify a problem or issue that sets the limit to the topic, so that you can focus your attention on a specific aspect of the problem or issue.
- Develop justification or rationale for studying the problem or issue.
- State the importance of the study to different stakeholders such as students, teachers, parents, school administration, and the community at large.
- This step operationalizes stage 2 of the Action Research framework, "Ask a question."

### 2 Design the Action Research

- Specify the research design that you will follow in order to implement the solution or intervention and to collect the data needed to answer the research question or prove the research hypothesis. There are only two possible research designs when interventions are applied—experimental and qualitative design.
- Experimental design requires collection of quantitative data.
- Qualitative design collects "thick" descriptions about the students and the classroom environment or school climate as well as sentiments about the intervention or solution applied. Data come in the form of narratives obtained through interviews, observations, or open-ended questionnaires.
- This operationalizes stage 3 of the Action Research framework, "Act to seek answers."

### 3 Collect Data for Action Research

- Data collection may be done *prior* to (baseline data; pretest or diagnostic Test), *during* (formative assessment), and *after* (posttest) the implementation of the intervention or solution.
- As Action Researchers, it is necessary to exercise due diligence in ensuring that every student who receives the intervention has complete set of data.
- Ensure that the selection of students who will receive the intervention, even if there is only a few of them, is justified.
- This step operationalizes stage 4 of the Action Research framework, "Acquire information."

### 4. Analyze and interpret data

- Apply appropriate statistical or qualitative data analysis techniques.
- Interpret the data and draw conclusions about the intervention applied.
- Display results in tables and figures (graphs) as means of summarizing the data.
- Ensure that the conclusions drawn answer the research question or confirm or disconfirm the research hypothesis.
- This step operationalizes the first part of stage 5 of the Action Research framework, "Analyze data."

### 5. Write the Action Research report

- Disseminate the research findings as the last step in operationalizing the Action Research framework.
- Share the "new" knowledge obtained from the study with other practitioners and policy-makers.
- Write a full Action Research report, which serves as primary means of sharing the result of the study. Other methods are executive summary, journal article, and news clip.

Take note that the only stages not operationalized are the first stage, "Assess the situation" and the second part of the last stage, "Reflect on the implemented Action Research." That is because these two conceptual features of the Action Research framework are mental processes that the Action Researcher engages in prior and after following the five steps of the Action Research process.

## UNDERSTANDING REVIEW OF LITERATURE

The **Review of Literature serves as** guides in the formulation of the research question. It assists the Action Researcher in deciding which research design is suitable for the study, including the number of participants. It provides direction in the collection of data in terms of sampling and collection methods. It provides insight on what statistical or qualitative analyses should be applied. It guides in the citation of findings from other studies that support the findings of the Action Research.

## IMPORTANCE OF ACTION RESEARCH FOR EDUCATIONAL STAKEHOLDERS

Action Research contributes to the needs of the different stakeholders in the educational system. The following are some examples of them:

1 Benefits for *students*: Better school performance

- Factors that contribute to student problems, such as poor school performance, low motivation, or frequent absenteeism can be identified.
- Interventions that have been proven to be effective through Action Research can be applied to address various concerns.
- Special students or students who are differently abled are given the attention and the kind of instruction suitable for them as Action Research explores teaching techniques and learning materials that are appropriately designed for them.
- Action Research on inclusive education can improve learning among special student populations as teachers learn more about "best practices" from their peers.
- Individual differences in the classroom are better addressed as instructional innovations are offered to teachers.

2 Benefits for *teachers*: Promotion of the culture of research

- Teachers are empowered to resolve problems in classrooms and schools.
- Teachers can address problems on the *least learned skills and competencies.*
- Teachers have better appreciation for what is happening or *not* in the classroom.
- Teachers get to identify the crucial changes that indicate improved teaching and learning.
- Teachers get to see the effectiveness of specific instructional strategies and classroom management techniques in the performance of target students.

(**Source**: http://www.thecreativeeducator.com/v07/articles/Embracing_Action_Research)

3 Benefits for *educational leaders*: Improvement in the access and the quality of education and governance (DepEd Order No. 43, s. 2015)

- Information on instructional innovations that teachers are implementing to solve problems in their own classrooms provide insight for necessary improvement in teaching personnel and educational practices.
- Results of classroom research serve as bases for necessary reforms and policy development (DepEd Order No. 16, s. 2017).

## PRACTICE/EXERCISE

Write your thoughts about Action Research inside the “thought cloud.” You can write as many thoughts as you have.

## REFERENCES

Creswell, John W. 2012. *Educational Research, Planning, Conducting, and Evaluating Quantitative and Qualitative Research*. Boston: Pearson Education, Inc.

Department of Education. 2017. Research Management Guidelines. DepEd Order No. 16, s. 2017.

Department of Education. 2015. Revised Guidelines for the Basic Education Research Fund (BERF). DepEd Order No. 43, s. 2015.

## NOTES/SIDEBAR

**Tip:** DepEd Order No. 144, s. 2017 may also be used as reference regarding the research process.

SESSION 2.1

# IMPLEMENTATION OF ACTION RESEARCH

# INTRODUCTION

The state policy to establish, maintain, and support a complete, adequate, and integrated system of education pertinent to the needs of the people, the country, and the society-at-large is the foundation for the creation of Republic Act 10533 titled "An Act Enhancing the Philippine Basic Education System by Strengthening its Curriculum and Increasing the Number of Years for Basic Education," otherwise known as the "Enhanced Basic Education Act of 2013."

One of the mandates of the Enhanced Basic Education Act of 2013 is the delivery of a curriculum that is *relevant*, *responsive,* and *research-based*. In line with this, the role of research in education is strengthened and integrated in both curriculum and instruction. Research is envisioned to serve as concrete guide in steering both policy and practice in the educational system.

To ensure relevance, responsiveness, and usefulness of studies in the production of fact-based policy and practice in the Department of Education (DepEd), the following Action Research process is designed. It serves as the first step in achieving the national goal of inculcating and propagating a culture of research from the grassroots of Philippine education to the highest levels of public-school governance. This strategic step is a vehicle toward the direction of realizing the legal mandate on conducting research as part of the DepEd's institutional target for each governance level in fulfilment of the Department's mission, vision and core values.

# STEPS/KEY CONCEPTS

## GUIDING PRINCIPLE

Implementation of Action Research includes *Guiding Principles* that support continuity, progression, and participation in all governance levels. These principles show the path for research facilitators and researchers (include school heads, teachers, administrators, and instruction-related and non-teaching personnel) in the delivery of research-based instruction and its necessary support anchored to DepEd's vision (figure 1.1), mission (figure 1.2), core values (figure 1.3), and strategic directions (figure 1.4).

## The DepEd Vision

We dream of Filipinos
who passionately love their country
and whose values and competencies
enable them to realize their full potential
and contribute meaningfully to building the nation.

As a learner-centered public institution,
the Department of Education
continuously improves itself
to better serve its stakeholders.

**Figure 1.1.** DepEd's Vision

## The DepEd Mission

To protect and promote the right of every Filipino to quality, equitable, culture-based, and complete basic education where:

**Students** learn in a child-friendly, gender-sensitive, safe, and motivating environment.

**Teachers** facilitate learning and constantly nurture every learner.

**Administrators and staff**, as stewards of the institution, ensure an enabling and supportive environment for effective learning to happen.

**Family**, **community**, **and other stakeholders** are actively engaged and share responsibility for developing life-long learners.

**Figure 1.2.** DepEd's Mission

## Our Core Values

*Maka-Diyos*

*Maka-tao*

*Makakalikasan*

*Makabansa*

**Figure 1.3.** DepEd's Core Values

## Strategic Directions

By 2022, DepEd is a modern, professional, proactive, nimble, trusted, and nurturing institution delivering quality, accessible, relevant, and liberating K to 12 Education, enabling our learners to be nation-loving, resilient, and complete lifelong learners.

**Figure 1.4.** DepEd's Strategic Directions

The provisions of DepEd Order No. 39, s. 2016 (Adoption of the Basic Education Research Agenda) have paved the way for the advancement of a concrete research agenda in Philippine basic education system that include the themes *teaching and learning*, *child protection*, *human resource development*, and *governance*. These themes serve as basis for the generation of topics that can be explored for the purpose of formulating research-based and sound policies.

DepEd's vision, mission, core values, and strategic directions serve as the foundation in the conduct of educational research among practitioners. Action Research strengthens educational policies by encouraging continuous improvement of services to its primary clients, the learners, thereby contributing to the achievement of educational goals. It is essentially a professionally meaningful scientific endeavor that is significant, proactive, manageable, and empowering. Teachers who engage in Action Research have the distinct privilege and rare opportunity of ensuring a school environment that is both supportive and enabling of learners. In order to accomplish these, the following guiding principles in the conduct of Action Research are suggested:

### Principle 1: Excellence

If Action Research is intended to influence educational decisions and actions, it must, first and foremost, adhere to the highest level of quality. The principle of excellence demands that the topic of inquiry be relevant and researchable, the methods applied be appropriate, and the findings be logical, coherent, and supported by data. Research designs will vary depending on the objectives of the study, but regardless of which design is used, researchers must apply rigorous empirical methods on which scientific inquiry is grounded.

## Principle 2: Integrity

The highest ethical standards must be employed by Action Researchers, most especially when the study involves the participation of people. Researchers must ensure that the study will not cause harm on human respondents. Informed consent must be obtained from research participants, ensuring that they are cognizant of the general purpose of the study and that all efforts are expended to prevent them from being exposed to unusual risk. Consistent with the principle of excellence, the principle of integrity also requires honesty and accuracy in the collection and analysis of data and the reporting of results.

## Principle 3: Openness

One of the keys to successful conduct of Action Research is collaboration. In line with this, the idea of openness gives emphasis to the need to engage more partners in Action Research that bring multidisciplinary perspectives to any inquiry, considering that research agenda in basic education is quite extensive. Dissemination of research results must be accurate and opportune. It should be arranged within the limits of confidentiality, safeguarding anonymity of participants and sanctity of the findings, and shared with stakeholders for appreciation, application, and evaluation.

To ensure the application of these principles, the following five protocols should be observed in the conduct of Action Research within the context of DepEd.

## Protocol 1: Reducing the risk of harm

Action Research should *not* bring harm to participants. If a study needs to be done despite the possibility that participants could be put in harm's way or in a situation that makes them feel some discomfort, there must be strong justification for pursuing it prior to the collection of data. Contingency plans for reducing harm or discomfort and/or detailed debriefing procedures should be spelled out in a written informed consent to be signed by each participant of their own free will. Types of harm that participants can be subjected to include physical harm, psychological distress and discomfort, psychosocial disadvantage, financial problems, and invasion of privacy and anonymity.

## Protocol 2: Securing informed consent

One of the procedures followed in keeping with research ethics is the securing of informed consent. It is a document that informs participants what their involvement in

the study entails and what sensitive information might have to be asked from them. It also includes the purpose of the research, the methods to be used, and the possible outcomes as well as the demands, discomforts, inconveniences, and risks that the participants may experience.

## Protocol 3: Safeguarding confidentiality and anonymity

Safeguarding the anonymity of research participants and the confidentiality of the information they provide is another important component in Action Research. At no point should their identities and other personal information about them be divulged to other individuals without their permission. Documents that bear their names, identities, and other sensitive information must be placed in a secure place that is accessible only to the researcher/s. The same documents may be disposed of through shredding after one year of research dissemination. Mere dumping of such documents in trash bins or "recyclable" receptacles is *improper*.

## Protocol 4: Avoiding deceptive practices

Action Researchers should avoid deceptive practices. It is their obligation to make the research participants understand the objectives of the study and the specific tasks that they (participants) have to do to provide the data needed. Although deception is sometimes necessary in order to obtain valid results, particularly when delicate information are to be obtained, participants should eventually be debriefed of the true objectives of the study.

## Protocol 5: Ensuring justice and fidelity

Fairness is another ethical practice that should be followed in conducting Action Research. This is an important consideration particularly in situations where the rights of one individual or group may affect those of another. To be just implies that the researcher adheres to the standards of impartiality, equality, and reciprocity in relating with research participants. Fidelity refers to being loyal and truthful to the respondents by keeping promises to them such as the anonymity of the respondents' identities and respecting their dignity as persons. Researchers should keep these things in mind as they interact with individuals who participate in their studies.

## Action Research mechanism

Action Research becomes a means for informed decisions in the field of education. The following are some examples.

### 1 Continuous improvement of research agenda and standards

DepEd has adopted the Basic Education Research Agenda (BERA) with the issuance of DepEd Order No. 39, s. 2016. BERA provides a road map for DepEd and its stakeholders in the conduct of research and in the utilization of research results for planning, policy formulation, and program development in alignment with its vision, mission, and core values. The research agenda is expected to build on findings from existing research, generate new knowledge on priority areas of study, focus on relevant education issues, and maximize the use of available resources for research within and outside the department.

The principles of excellence, integrity, and openness are the backbones of the BERA. Each theme under the BERA has a unique contribution to the attainment of the department's official mandate and projected outcomes. *Teaching and learning* respond to students' and teachers' needs and address the quality of education. *Child protection* focuses on students' safety and security and directly enhances access to education. *Human resource development* pertains to concerns on teaching and nonteaching staff, while *governance* examines administration and stakeholder engagement.

In addition to the four major themes specified in the BERA, DepEd also recognizes three current areas of inquiry that cut across the themes: (1) disaster risk reduction and management (DRRM), (2) gender and development, and (3) inclusive education.

Essentially, the research agenda presents trends and issues that can spur new insights about classroom practices and practical solutions to classroom problems upon investigation. More importantly, the research agenda can orient and advise policy makers on matters that necessitate the formulation of policy statements. Periodic review of the BERA vis-à-vis consolidated research results, new education trends, and emerging education issues will enable the department to adjust strategies in promoting the conduct of Action Research.

### 2 Action Research training through LAC session

Continuing professional development of teachers anchored on the principle of lifelong learning and DepEd's commitment to the enrichment of teachers' potentials

are expressed in the issuance of DepEd Order No. 35, s. 2016, which institutes Learning Action Cell (LAC) as school-based continuing professional development strategy in the K-12 basic education program for the purpose of improving teaching and learning.

The LAC's primary function is the creation of a professional learning community among teachers with the same school to help them improve their practice and enhance learners' achievement. Through LAC sessions, the vision of developing a "culture of research" is expected to gradually materialize by providing teachers the necessary training and technical assistance in conducting Action Research.

DepEd's outcomes-based policy should guide schools in the implementation of the Action Research as a means of promoting scientific inquiry for the purpose of improving instruction and learning outcomes. The school-based Action Research training will provide teachers with basic knowledge and skills for initiating learner-focused interventions that address learning gaps and issues within their classrooms in order to upgrade learning outcomes.

School-based LAC sessions are planned and scheduled by the school head with the assistance of the school LAC facilitator. LAC plan for each school shall include the full Action Research training when deemed necessary or selected Action Research topics according to the training needs of teachers.

*Facilitator's Guides* for Action Research training help school facilitators lead LAC sessions on the essentials of Action Research. *Teacher's Quick Guides* correspond to topics discussed in the *Facilitator's Guides* and serve as basic resource materials for teachers and as supplementary materials to the LAC sessions. The Action Research framework, Action Research designs, data collection and analysis methods, and Action Research writing are all covered in the Action Research training through a series of LAC sessions. The use of LAC meetings as training sessions for Action Research is a step toward fulfilling the DepEd's commitment to help equip teachers in engaging in Action Research. It is a way of enhancing teachers' potentials for self- and professional development.

Technical assistance will be provided through a continuous system of consultation, mentoring, and coaching of training participants in the course of the LAC sessions.

### 3 Analysis of results for policy recommendation

After completion of the Action Research training through LAC sessions, teachers are expected to work individually or collaboratively on an Action Research project. Results of Action Research undertaken by teachers will be compiled and synthesized

for discussion on how they can be utilized for policy recommendations. DepEd Order No. 13, s. 2015, which establishes a Policy Development Process at the DepEd, provides systematic, evidence-based, and participatory mechanisms and procedures for the formulation, adoption, and review of policies. Policies recommended based on findings of Action Research projects should be anchored on DepEd's vision, mission, and core values to ensure that these are geared towards effective and efficient attainment of education outcomes.

Discussions on the results of Action Research may be conducted during LAC sessions, so that policy recommendations can come from teachers themselves. The school head may organize a LAC session solely for the discussion of results of Action Research projects in the school. The formulation of policy for recommendation shall then be agreed through the participation of relevant stakeholders. Sound Action Research findings, recommendations from experts, and insights from relevant stakeholders all contribute to the process of articulating evidence-based policy recommendations. Proposed policies may be submitted to the DepEd Central Office through the Planning Service-Policy Research and Development Division (PS-PRD) for management-level discussion and, possibly, endorsement for approval.

## 4 Dissemination and adoption of policy through evidence-based research

DepEd Order No. 13, s. 2015, which promotes evidenced-based policy formulation, supports one of the provisions of the Basic Education Act of 2001 (Republic Act 9155). The provision mandates the "undertaking of educational research and studies that will serve as one of the bases for necessary reforms and policy development" (RA 9155 Chapter 1, Sec. 5–7).

Once a policy recommendation is approved, it shall then be disseminated for adoption through an issuance of guidelines in the form of an *order* from the DepEd Central Office. A school, division, or regional office can disseminate the research results with their policy recommendations among their teachers in the form of research conferences, research forums, and policy forums. Research proponents and research managers can share their research findings, gather new inputs and research ideas, and discuss policy options based on research results. Publication in research journals, research bulletins, and studies archival mechanisms for completed studies are options for wider dissemination.

Utilization of research results by teachers through incorporation of proven effective interventions in their classroom instruction and adoption of the policy recommendations of research will improve learning outcomes and governance processes.

## Action Research Framework

The *Action Research framework* serves as the structural basis for procedures from the first step of identifying a topic to the last step of analyzing research data and reflecting upon the results, which, in turn, can be the beginning of another study following a cyclical series of activities. The framework guides Action Researchers in working through the process of finding a focus and design for the study, collecting and analyzing data, and drawing conclusions (figure 1.5). It involves five (5) stages known as the 5 A's: Assess the situation, Ask a question, Act to seeks answers, Acquire information, and Analyze and reflect on the results.

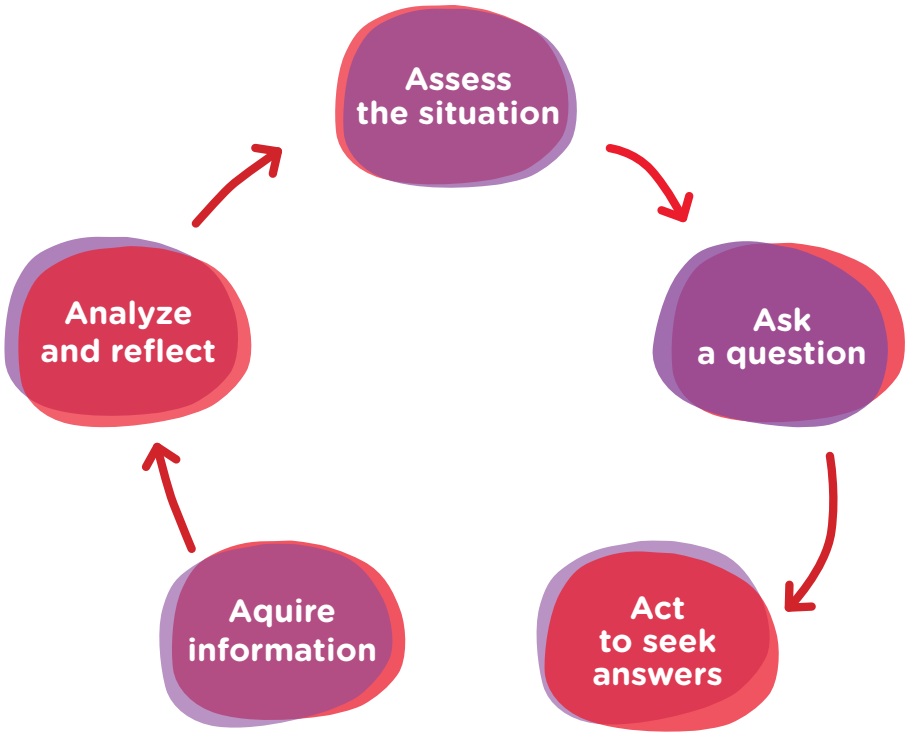



**Figure 1.5.** Action Research Framework.

## Stage 1: Assess the situation

At this initial stage, practitioners identify improvement opportunities in the teaching-learning process. Also called *reconnaissance* in other Action Research models, this stage involves examination of school environment, academic programs, instructional practices, and learners. Specifically, it is during this stage that teachers ruminate on student outcomes (achievements and dispositions), curriculum (standards, competencies, and instructional materials), instruction (teaching strategies, use of technology), school climate (student and teacher morale, relationships between

students and teachers and between teachers and supervisors), and parental involvement (attendance at events, involvement in parent-teacher committees).

## Stage 2: Ask a question

The research question is a clear, focused, concise, complex, and arguable question where the research is centered in. It is central to an Action Research project as it gives focus to it and guides all stages of inquiry, from the determination of the methods for data collection and analysis and to the writing of the research report. Action Research is different from other types of research in that the researcher has to go beneath the surface of a classroom problem or instructional/learning issue in order to identify a topic. A practitioner also needs to ask why something is happening or not in order to generate a research question. During this stage, the teacher tries to gain insight into the problem by looking for its root cause and thinking of a possible solution.

## Stage 3: Act to seek answers

When an Action Research topic has been identified based on an observed problem or issue, a tentative solution should be formulated from a careful review of literature. It is then methodically implemented, either for one single learner or for an entire class. To be able to answer the research question, the teacher has to design and test an appropriate intervention with a view of ultimately solving it. The intervention should address the problem or issue or at least part of it.

## Stage 4: Acquire information

This stage entails gathering information (data) about the intervention as implemented. Certain types of information require specific ways of collection. The researcher should choose the data collection instructions that are appropriate for the intervention implemented and for the Action Research question. Some research questions require quantitative data while others necessitate qualitative data.

## Stage 5: Analyze and reflect

In this stage, data analysis and interpretation are performed. When an Action Researcher reflects on the findings of his or her inquiry, he or she is able to derive conclusions and recommendations that are rooted on and aligned with the results. He or she can decide if the intervention that has been implemented responds to the problem or issue earlier identified. He or she can also say if the intervention can be

replicated in other classrooms where teachers face the same troubles. He or she may also think of another intervention that needs to be tried out, which then serves as starting point for another Action Research cycle.

## Operationalizing the Action Research Framework

The Action Research framework is a philosophical and theoretical structure that defines the key points in Action Research in five (5) stages. These stages are concretized or operationalized in five major steps or activities that take after the scientific method, which essentially determine the reasonableness or acceptability of a hypothesis about the effectiveness of a proposed intervention as an attempt to solve a classroom problem or issue. The following are the steps in operationalizing the Action Research framework in one's own investigation:

### 1 Identifying the Action Research problem

The most critical step in research is *knowing* what the problem is. Defining the classroom problem or issue that needs to be solved helps a researcher decide on what specific intervention is suitable. Once an intervention has been devised, the researcher can plan on what information has to be collected and how.

### 2 Designing the Action Research

A research design is simply a set of related procedures that have to be followed in order to generate relevant information with minimal effort, time, and money. *Experimental* and *qualitative* research designs are two methods that can be applied when testing the effectiveness of an intervention depending on its nature and the extent to which the researcher can control variables. Action Researchers can either choose to collect numerical data, in which case an experimental design is appropriate. He or she may also choose to collect descriptive data, which requires a qualitative design. Prior to the enforcement of an intervention, Action Researchers can conduct a preliminary assessment of the problem situation (stage 1 of the Action Research framework) using any of the other major research designs, namely, *causal comparative* (or *ex-post facto*), *correlational*, and *survey*.

### 3 Collecting data for Action Research

Data collected after intervention has been implemented gives a clear picture of the effect of the teacher's action on the variables of interest. Post-intervention data may be obtained through *paper-and-pencil instruments*, *interviews*, *observations*,

or *documents* and *materials*. While one data collection method is sufficient, a combination of quantitative and qualitative data collection methods (called mixed methods) is often preferred and profitable for the research.

### 4 Analyzing data for Action Research

Data analysis may be performed using the appropriate statistical technique for numerical data or qualitative analysis for descriptive (narrative) data. Descriptive and inferential statistics are useful for data collected using tests and rating scales. Examination of recurring themes or patterns (qualitative analysis) is most appropriate for data obtained from interviews, observations, or documents and materials.

### 5 Writing the Action Research report

The Action Research report contains a detailed description of the problem situation or issue, the intervention applied, the methods used in collecting and analyzing data, and the findings of the study. Several types of reports (from executive summary to conference paper) may be produced, but it is important to complete the full research report first before coming up with synthesized versions. The results of the research must be reported not only to the participants and other stakeholders, but also to those who need the information in making critical decisions. This help ensure that the decisions they come up with are grounded on sound and objective research findings and are not just subjectively formulated based on personal preferences and inclinations.

## Action Research Implementation Model

All of the key concepts in the Action Research framework and the corresponding steps for its operationalization comprise the Action Research Implementation Model (see figure 1.6). *Direction* and *guidance* for Action Research are provided by the *principles of the DepEd* as expressed in its vision, mission, and core values as well as the research strategic directions formulated for the department.

The method by which Action Research is implemented is called the *Action Research Mechanism*. This involves three practices, namely: (1) continuous improvement of the research agenda and standards, (2) Action Research training conducted through Learning Action Cell (LAC) sessions, and (3) analysis of research results for policy recommendations.

Teachers engage in classroom-based investigation following the Action Research framework, a philosophical, theoretical structure composed of five stages (Assess the situation, Ask a question, Act to seek answers, Acquire information, and Analyze and reflect). It is operationalized through the five (5) steps or activities of the *Action Research process* (Identifying the research problem, Designing the Action Research, Collecting data, Analyzing data, and Writing the Action Research report). All the five activities, particularly the last one, are considered for *Policy Recommendation, Adoption, and Dissemination*. Finally, through *Monitoring and Evaluation* and *Provision of Technical Assistance*, policy recommendations are examined so that adjustments in the DepEd vision, mission, core values, and research strategic directions can be appropriately initiated.

## The Action Research Implementation Model

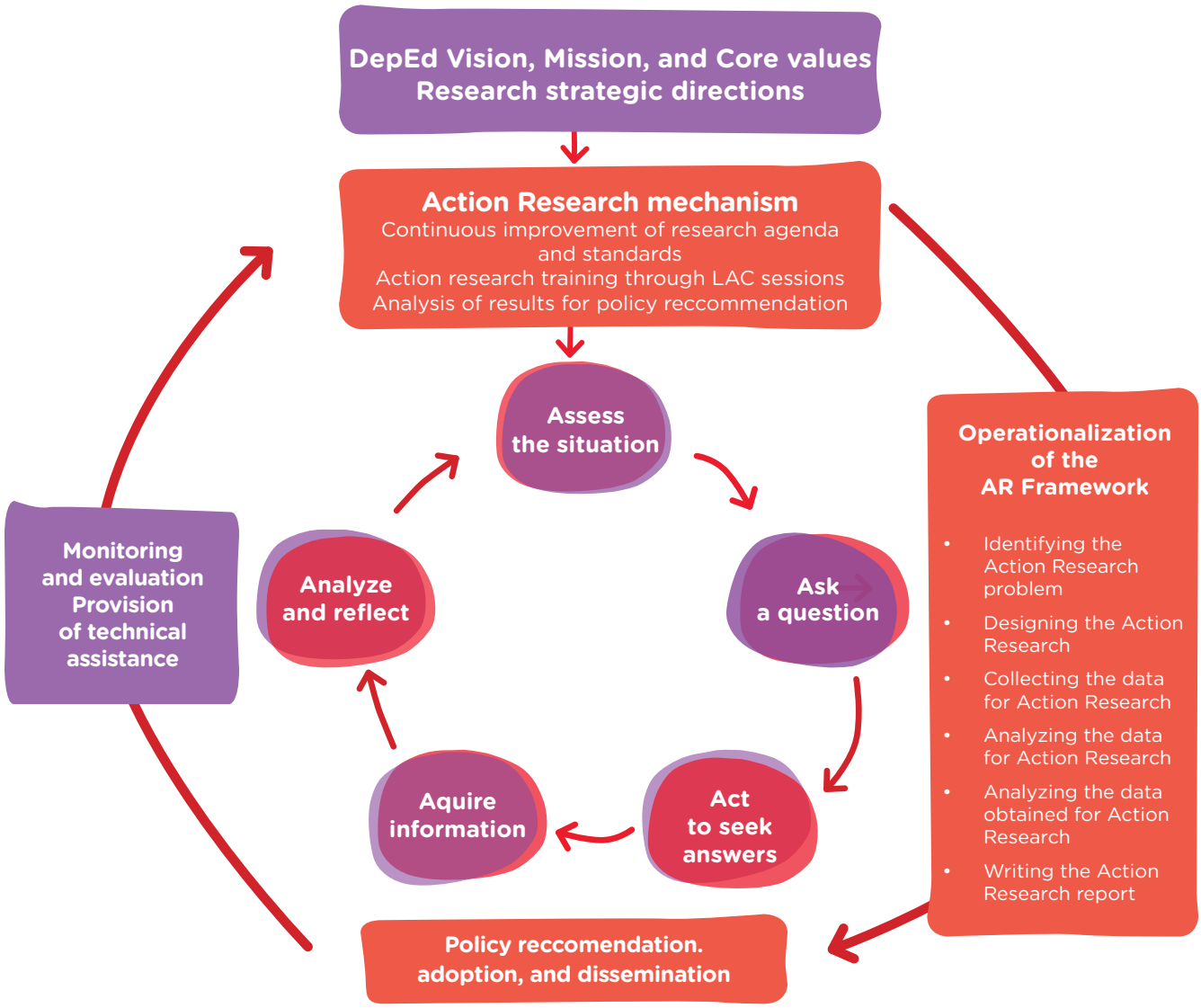



**Figure 1.6.** Action Research implementation model

## Feedback Mechanism

The following are the different feedback mechanisms utilized in the conduct of Action Research.

### 1 Monitoring and evaluation

The *Schools Division Research Committee* is responsible for ensuring that Action Research projects are reliably monitored by those who supervise the teacher/s conducting it. They should also ensure and verify that the conduct of research conforms to the Action Research proposal and work plan as approved.

To track the progress of approved proposals, research managers have to conduct random visits or inspection at research sites and discuss with the researchers the status of their studies. They may ask for progress reports from researchers and interview them regarding their investigations. Other feedback mechanisms may be worked out between research managers and researchers according to their situations and needs. Emails may be used as means of obtaining updates on ongoing research projects.

For continuous improvement of the management of Action Research, research managers in the national, regional, and division levels have to conduct regular and prescheduled monitoring of approved Action Research proposals and initiatives. Information solicited through monitoring activities should lead to the improvement of the feedback mechanism.

### 2 Provision of technical assistance

Research managers are expected to provide technical assistance to researchers when the need for such is expressed through feedback and monitoring schemes. They are to assist researchers in formulating Action Research questions, developing and implementing pertinent and relevant interventions, collecting and analyzing data, and writing the research report. They should also support researchers who use LAC sessions as means of disseminating results. In other words, their role will be that of mentor and coach for teacher investigators. Whenever necessary, research managers may also conduct or supervise the conduct of LAC sessions on Action Research, wherein Facilitators' Guides, Teacher's Guides, related documents, and other relevant resources are made available for their use.

# REFERENCES


Department of Education. 2016. Adoption of the Basic Education Research Agenda. DepEd Order No. 39, s. 2016.

Department of Education. 2015. Establishment of a Policy Development Process at the Department of Education. DepEd Order No. 13, s. 2015.

Department of Education. n.d. "Mandate." Department of Education (website). Accessed May 14, 2018. http://www.deped.gov.ph/mandate.

Department of Education. 2017. Supplemental Research Guides and Tools. DepEd Order No. 144,s. 2017.

Department of Education. 2016. The Learning Action Cell on a K to 12 Basic Education Program School-Based Containing Professional Development Strategy for the Improvement of Teaching and Learning. DepEd Order No. 35, s. 2016.

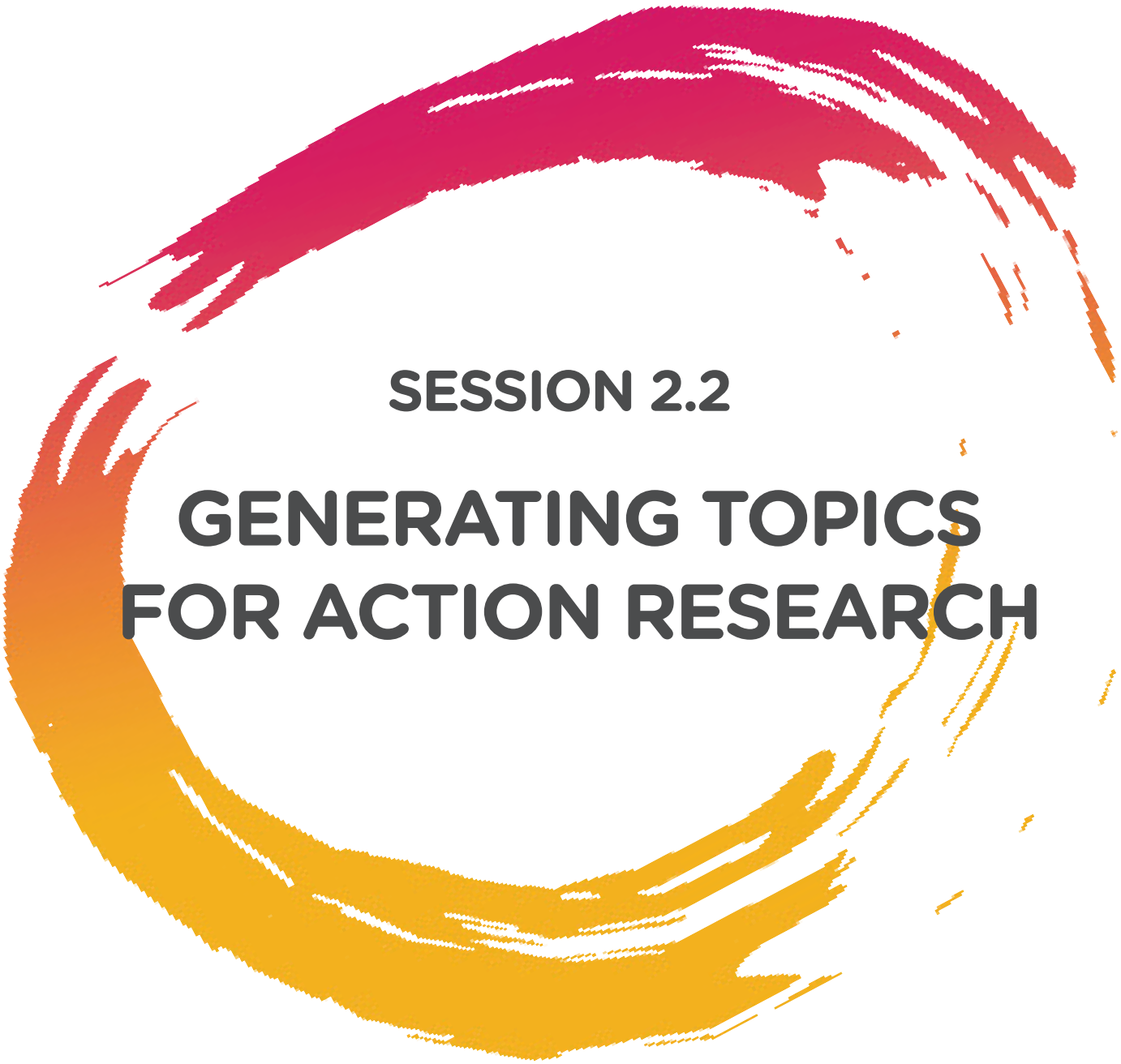
Enhanced Basic Education Act, Republic Act 10533. (2013)

Governance of Basic Education Act of 2001. Republic Act 9155 Chapter 1, Section 7 (5).

Laerd Dissertation. n.d. "Principles of Research Ethics." Lund Research Ltd (website). Accessed May 14, 2018. http://dissertation.laerd.com/principles-of-research-ethics.php.

Syracuse University School of Education. n.d. "Ethical Principles." Syracuse University School of Education (website). Accessed May 14, 2018. http://soe.syr.edu/academic/counseling_and_human_services/modules/Common_Ethical_Issues/ethical_principles.aspx.

Republic of the Philippines. 2013. Enhanced Basic Education Act. Republic Act 10533.



SESSION 2.2

# GENERATING TOPICS FOR ACTION RESEARCH

## OBJECTIVES

At the end of this section, the reader will be able to:

1. identify problems or issues in their classrooms and consider possible interventions for them through reflection;
2. examine the alignment of the identified classroom problems or issues with the Basic Education Research Agenda (BERA); and
3. evaluate possible topics for Action Research according to the DepEd criteria.

## INTRODUCTION

There are many problems or issues that teachers face in the classroom, and all of them need attention. It is therefore not easy to identify a specific topic for an Action Research. Thus, it is necessary to prioritize the problems or issues and select the one that is the most urgent or most serious.

Identifying an Action Research topic is a crucial part of the Action Research process since it sets the direction of the study. In planning for your Action Research, you will have to reflect on what is happening inside your classroom. You have to look into the things that may be hindering your students from meeting the expected competencies.

This section will help facilitate your reflection on classroom problems or issues from which you can generate your Action Research topic. The DepEd's Basic Education Research Agenda (BERA), which will also be presented, will serve as your guide in identifying your topic.

## STEPS/KEY CONCEPTS

### LOOKING AT YOUR CONTEXT

- *Reflect on your situations and experiences*. Look at the pressing problems or issues in your classroom. Assess whether your students attend classes regularly. Evaluate their performances. Do you have students at risk of failing or dropping out? Conduct self-assessment on your teaching strategies. Consider the different type of learners in your classroom.
- *Identify a topic for Action Research*. Based on your reflections on the aforementioned questions, which problem or issue seems to be the most urgent or most serious? What could be a possible research topic? What is your preference? Are you comfortable to conduct Action Research alone or with other teachers?

## DEVELOPING AN INTERVENTION FOR THE PROBLEM OR ISSUE

- *Reflection-for-action* is thinking about thoughts and planning for future action (Hendricks, 2006).
- The following are 4 Easy Quick Tips (EQT) in generating Action Research topics.
  - a **Start with end goals.** What do you want to see happen at the end of your study? List two or three of these expected outcomes.
  - b. **Share with co-teachers** your interest in the topics and generate some more ideas, particularly on how to solve the problems or issues that you have identified.
  - c. **Write your ideas in your journal.** Keep on adding to the ideas you have noted as you converse with your fellow teachers about your topics. Remember not to discard any idea as it might be useful in the future.
  - d. From your list of problems or issues, **select your priority topic and describe what intervention/s** you might be able to implement to solve it. Again, do not throw away any idea as you may have to return to your original thoughts to finalize your intervention.

## BASIC EDUCATION RESEARCH AGENDA (BERA) THEMES

The following are the themes listed in the DepEd's BERA. See under which theme your priority topic might fall.

1. **Teaching and Learning.** This research theme covers the actors, activities, and fundamental aspects of teaching and learning in various contexts.
2. **Child Protection.** This research theme focuses on incidents of child abuse such as bullying, teenage pregnancy, addictive behaviors, and child labor.
3. **Human Resource Development.** This research theme includes studies on the vast human capital involved in delivering basic education such as teaching and non-teaching personnel, hiring qualifications, career development, and employee welfare.
4. **Governance.** This research theme encompasses planning, finance, program management, transparency and accountability, and evaluation. It underscores DepEd's commitment to ensure that its structure, systems, and processes contribute to the achievement of basic education outcomes.

## PRACTICE/EXERCISE

Identify a possible Action Research topic by accomplishing the following worksheet.

**Worksheet on Evaluating Possible Action Research Topics**

Name:_____ School:_____

*Direction*: List at least three (3) problems or issues in your classroom. Prioritize them according to these four criteria: *strategic importance*, *urgency*, *magnitude*, and *feasibility*.

**Rubric**

| Criterion | Description | Heading |
|---|---|---|
| Strategic importance | The number of other persons or subject areas that will benefit when the intervention is found to be effective | 5 - Very high |
| Urgency | The degree to which the solution to the problem is needed in the quickest time possible. | 4 - High |
| Magnitude | The number of learners that will benefit when the intervention is found to be effective. | 3 - Moderate |
| Feasibility | The degree to which the intervention can be implemented easily in the classroom or school. | 2 - Low<br>1 - Very Low |

| List of problems issues/concerns | Strategic importance | Urgency | Magnitude | Feasibility | Total |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

## REFERENCES

Hendricks, Cher C. (2006) 2012. *Improving Schools through Action Research: A Reflective Practice Approach*. Boston, MA: Pearson Education Inc.

Department of Education. 2017. Research Management Guidelines. DepEd Order No. 16, s. 2017.

Department of Education. 2016. Adoption of the Basic Education Research Agenda. DepEd Order No. 39, s. 2016.

Department of Education. 2017. Supplemental Research Guides and Tools. DepEd Memorandum No. 144, s. 2017.

## NOTES/SIDEBAR

**Tip:** The Basic Education Research Agenda of DepEd (DepEd Order No. 39, s. 2016) may also be referred to when choosing a research topic. Just make sure that the topic you choose is relevant to your situation.

SESSION 2.3

# FORMULATING AND EVALUATING ACTION RESEARCH QUESTIONS AND HYPOTHESES

## OBJECTIVES

At the end of this section, the reader will be able to:

1. understand the criteria for good Action Research questions;
2. develop Action Research question/s and corresponding hypothesis/es; and
3. assess the quality of Action Research questions formulated based on the five criteria for good research questions.

## INTRODUCTION

After you have decided on your Action Research topic, you are now ready to proceed to the first step in the Action Research process. That is "identifying the Action Research problem," which can be stated as the research question.

In this section, you will learn about the characteristics of a sound Action Research question, the details of the DepEd's "Research Management Guidelines" (RMG) for appraising research questions, and the types of research questions and research hypotheses.

## STEPS/KEY CONCEPTS

### LOOKING BACK AT YOUR RESEARCH TOPIC

- *Clarify your perspectives and beliefs* about your Action Research topic. You may then formulate a personally meaningful research question to guide your inquiry.
- *Discuss with your co-teachers or colleagues* your research question. You may assess your Action Research question using the criteria for good research questions. This may open an opportunity for collaborative Action Research project. This discussion may be done during the Learning Action Cell (LAC) sessions or during informal conversations. Afterwards, you can present your Action Research question to your colleagues for further evaluation using the DepEd's "Research Management Guidelines" (RMG). the Annex 4.b: Guide for Appraising Action Research Proposals on "Action Research Question/s" (DepEd Order No. 16, s. 2017).

## FORMULATING YOUR ACTION RESEARCH QUESTION

The following are the characteristics of a good Action Research question. Rewrite the provided sample research questions according to each criterion.

1 **Clearly stated.** The research question should be easily understood by the readers.

| Unclear | Clear |
|---|---|
| Does using the internet help develop language skills? | |

2. **Significant.** The research question should contribute to the body of knowledge. The results of the study should benefit students, teachers, and schools.

| Not significant | Significant |
|---|---|
| Do wooden chairs sustain pupils' attention span? | |

3. **Ethical.** The research question should respect human dignity and rights of the participants. It should not create any form of harm to the participants of the study

| Not ethical | Ethical |
|---|---|
| Does exposing students to nicotine fumes affect their memory? | |

4. **Feasible.** The research question should be doable in terms of resources, time, as well as researcher's skills.

| Not feasible | Feasible |
|---|---|
| Does the use of tablets help High School students in all levels do better in Science? | |

5. **Leads to making an action.** The research question must lead to taking an action—trying out an intervention for the purpose of improving a teaching/ learning situation.

| Does not lead to making an action | Leads to making an action |
|---|---|
| Are older children more responsible than younger ones? | |

After reformulating the research questions above to conform to the foregoing five criteria, you may *compare your answers to the suggested ones provided at the end of this section.*

## TYPES OF ACTION RESEARCH QUESTIONS

The following are the different types of Action Research questions (Creswell, 2012).

1. **Quantitative research questions** are those that ask about quantitative variables and require numerical data.
   *Examples:*
   - **a** Do the final scores improve after the intervention?
   - **b** Are the grades of those students exposed to the intervention higher than those who were not?

2. **Qualitative research questions** are those that ask for descriptions and narratives.
   *Examples:*
   - **a** How does parental involvement affect students' attitude toward school?
   - **b** In what way/s does/do the intervention help students understand the lesson better?

Here are a few more examples for you to consider:

**Table 2.3.1.** Type of research, questions, and sample variables.

| Type of Research | Question | Variables | Demographic Group (Research Subjects) |
|---|---|---|---|
| **Experimental** | Is there a significant difference between students' attendance before and after the feeding program? | • feeding program (independent variable)<br>• students' attendance (dependent variable) | **Grade 1 pupils** |
| **Qualitative** | In what way/s does group work help students develop social skills? | • group work<br>• social skills | **Secondary School students** |

## RESEARCH HYPOTHESIS

*Research hypothesis* is the tentative answer to the research question. It is the hypothesis of interest in the study or the statement that the Action Researcher wants

to support. An example of a research hypothesis is "There is a difference in the scores of those students who were given the intervention and those who were not."

However, in scientific inquiry, the research hypothesis is stated together with the *null hypothesis*. This is the *opposite* of the research hypothesis. Its purpose is to be *nullified* or rejected in order for the Action Researcher to accept or support his or her hypothesis. An example of null hypothesis is "There is no difference in the scores of those students who were given the intervention and those who were not."

Depending on how the Action Researcher wants to state his or her research hypothesis, a pair of null and research (also known as alternative) hypotheses can either be *nondirectional* or *directional*.

The pair of hypotheses given earlier as examples is *nondirectional*. They can also be written as follows:

| | |
|---|---|
| *Null Hypothesis*: The scores of those students who were given the intervention will be *equal* to those who were not given the same. | *Research Hypothesis*: The scores of those students who were given the intervention will *not be equal* to those who were not given the same. |

Do note that when you decide to formulate a quantitative research question for your Action Research, the hypotheses come in pair, the null hypothesis and its corresponding research hypothesis. Quantitative research questions ask about variables that are measured numerically. The null hypothesis, as stated in examples above, is tested using statistical analysis. The aim is to reject it so that we can accept the research hypothesis, which really is the one of interest to us. Instead of saying that there is "*no* difference between the experimental and control groups," we would like to say that "*there is* a difference" between them. That is because when there is a difference and it is in favor of the intervention we implemented with the experimental group, then we have successfully carried out our Action Research. That means we have found a solution to the classroom problem that we wanted to resolve.

However, when you think a qualitative research question is more suitable for your topic and intervention, the hypothesis is a *tentative* one. We state what we expect to happen, but it is only a *working hypothesis*. In the end, we come up with a *grounded theory* about the intervention implemented. It is *grounded* because it comes from, and is supported by, the data we have obtained.

# PRACTICE/EXERCISE

Enrich your skill in formulating Action Research questions by doing the following exercise. Fill in the table guided by the example provided.

**Sample:**

| Questions | Data required (Quantitative/ Qualitative) | Answerable by YES or NO | Directional/ Nondirectional | Null and alternative hypotheses |
|---|---|---|---|---|
| Is there a significant difference between the scores of group X and group Y? | Quantitative data | ✓ | Nondirectional | *Null hypothesis:* There is no significant difference between the scores of group X and Y.<br>*Alternative hypothesis:* There is a significant difference between the scores of group X and group Y. |
| How does journal writing develop critical thinking skills in children? | Qualitative data | - | - | Journal writing helps pupils evaluate their own experiences and thoughts thereby helping them improve their critical thinking. |

Begin answering here:

| Questions | Data required (Quantitative/ Qualitative) | Answerable by YES or NO | Directional/ Nondirectional | Null and alternative hypotheses |
|---|---|---|---|---|
| 1 Does achievement increase after implementation of the intervention? | | | | |
| 2 How do students regard strategic intervention materials (SIM)? | | | | |
| 3 What thinking skills are developed by computer games? | | | | |
| 4 Is the posttest score significantly higher than the pretest score? | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **5** | Is modular instruction helpful for physically-challenged students? | | | | |
| **6** | Does journal writing help students develop English proficiency? | | | | |
| **7** | Is there a significant difference between the posttest scores of the experimental and control groups? | | | | |
| **8** | Do homeroom sessions on bullying reduce the incidence of the behavior in school? | | | | |
| **9** | IAre the posttest scores higher than the pretest scores after applying ICT-based instruction? | | | | |
| **10** | Is cooperative learning effective in improving students' problem-solving skills in Mathematics? | | | | |

**NOTE:** Please refer to **the suggested** answers provided **at the end of this section**.

# REFERENCES


Creswell, John W. 2012. *Educational Research Planning, Conducting, and Evaluating Quantitative and Qualitative Research.* Boston: Pearson Education, Inc.

Dana, Nancy F. 2013. *Digging Deeper into Action Research: A Teacher Inquirer's Field Guide.* Thousand Oaks, CA: Corwin.

Department of Education. 2017. Research Management Guidelines. DepEd Order No. 16, s. 2017.

Fraenkel, Jack R. and Norman E. Wallen. (1990) 2008. *How to Design and Evaluate Research in Education.* Boston: McGraw Hill.

Hendricks, Cher C. (2005) 2008. *Improving Schools through Action Research: A Comprehensive Guide for Educators.* Boston: Pearson Education, Inc.

# NOTES/SIDEBAR

**Tip:** To further ensure that your research initiatives are compliant with DepEd's set of requirements and parameters, you may refer to the following issuances:

- DepEd Order No. 16, s. 2017 (Research Management Guidelines),
- DepEd Order No. 39, s. 2016 (Adoption of the Basic Education Research Agenda)

**Tip:** If you have not yet decided on a topic for Action Research, you may begin by engaging in self-reflection. What problems have you encountered in your school or classroom? Does this problem need immediate attention? Can this problem be addressed through an Action Research?

You may use the following list of potential topics for Action Research to find a focus for your investigation. Variables that pertain to teachers and parents are included because these are related to students and their school performance.

- Attendance
- Behavior/Discipline
- Collaboration
- Counseling program
- Dropout prevention
- Extracurricular participation
- Inclusion
- Mentoring gifted students
- Media influence
- Motivation
- Needs of at-risk students
- Parental involvement
- School climate
- Student achievement
- Student attrition
- Professional development
- Technology

# ANSWER KEYS

## SUGGESTED RESEARCH HYPOTHESES

### 1 Clearly stated

| Unclear | Clear |
|---|---|
| Does using the internet help develop language skills? | *Does using word processor help improve students' spelling and grammar skills?* |

## 2 Significant

| Not significant | Significant |
|---|---|
| Do wooden chairs sustain pupils' attention span? | *Do audio-visual presentations of lessons increase pupils' attention span?* |

## 3 Ethical

| Not ethical | Ethical |
|---|---|
| Does exposing students to nicotine fumes affect their memory? | *Does the use of mnemonic devices enhance students' memory skills?* |

## 4 Feasible

| Not feasible | Feasible |
|---|---|
| Does the use of tablets help High School students in all levels do better in Science? | *Does the use of tables boost Grade 10 students' learning in Physics?* |

## 5 Leads to making an action

| Does not lead to making an action | Leads to making an action |
|---|---|
| Are older children more responsible than younger ones? | *Does the use of graphic organizers foster students' interest and achievement in Filipino?* |

## ANSWER TO PRACTICE/EXERCISE

| Questions | Data required (Quantitative/ Qualitative) | Answerable by YES or NO | Directional/ Nondirectional | Null and alternative hypotheses |
|---|---|---|---|---|
| 1 Does achievement increase after implementation of the intervention? | Quantitative | ✓ | Directional | *Null hypothesis*: Posttest achievement is lower or equal to pretest achievement.<br><br>*Alternative hypothesis*: Posttest achievement is higher than pretest achievement. |
| 2. How do students regard strategic intervention materials (SIM)? | Qualitative | | | *Alternative hypothesis*: Students enjoy lessons when they are presented using SIM. |

| | | | | | |
|---|---|---|---|---|---|
| **3.** | What thinking skills are developed by computer games? | Qualitative | | | *Alternative hypothesis*: Strategic problem-solving and forecasting are some of the skills developed by computer games. |
| **4.** | Is the posttest score significantly higher than the pretest score? | Quantitative | ✓ | Directional | *Null hypothesis*: Posttest scores are lower or equal to pretest scores.<br><br>*Alternative hypothesis*: Posttest scores are higher than pretest scores. |
| **5** | Is modular instruction helpful for physically-challenged students? | Quantitative | ✓ | Nondirectional | *Null hypothesis*: The achievement levels of regular students exposed to modular instruction is the same as those of physically-challenged students attending regular classes.<br><br>*Alternative hypothesis*: The achievement levels of regular students exposed to modular instruction is not the same as those of physically-challenged students attending regular classes. |
| **6** | Does journal writing help students develop English proficiency? | Qualitative | | | *Alternative hypothesis*: Journal writing helps students apply what they have learned about grammar, which reinforces their English proficiency. |
| **7** | Is there a significant difference between the posttest scores of the experimental and control groups? | Quantitative | ✓ | Nondirectional | *Null hypothesis*: There is no significant difference between posttest scores of the experimental group and those of the control group.<br><br>*Alternative hypothesis*: There is a significant difference between posttest scores of the experimental group and those of the control group. |

| | | | | | |
|---|---|---|---|---|---|
| **8** | Do homeroom sessions on bullying reduce the incidence of the behavior in school? | Quantitative | ✓ | Directional | *Null hypothesis*: The incidence of bullying after homeroom sessions on bullying is the same as or higher than that before homeroom sessions.<br><br>*Alternative hypothesis*: The incidence of bullying after homeroom sessions on bullying is lower than that before homeroom sessions. |
| **9** | Are the posttest scores higher than the pretest scores after applying ICT-based instruction? | Qualitative | | | *Alternative hypothesis*: Students learn to manage their own learning by finding materials to help them understand their lessons on their own. |
| **10** | Is cooperative learning effective in improving students' problem-solving skills in Mathematics? | | ✓ | | *Null hypothesis*: Problem-solving skills in Mathematics do not improve after using cooperative learning.<br><br>*Alternative hypothesis*: Problem-solving skills in Mathematics improve after using cooperative learning. |

SESSION 3.1

# DESIGNING AN EXPERIMENTAL ACTION RESEARCH

# OBJECTIVES

At the end of this section, the reader will be able to:

1. state the unique feature of experimental research design;
2. characterize three different types of experiments with regard to the presence of a control group and the selection of participants; and
3. select the appropriate type of experiment for given Action Research topics.

# INTRODUCTION

We have already established that Action Research is different from Basic and Applied Research because it is pursued to find solutions to a problem or issue in the classroom as identified by the teacher-investigator. Therefore, Action Research entails the implementation of an intervention as a response to the problem or issue. One major research design that is often associated with the implementation of an intervention or application of a treatment is the *experimental research design*. In this section, you will be introduced to this particular research design.

# STEPS/KEY CONCEPTS

## UNDERSTANDING EXPERIMENTAL DESIGN

*Experimental research design* (simply, *Experiments*) is an Action Research design that determines causation or cause-and-effect relationship between variables. Its distinctive feature is the manipulation of an independent variable to see its effect on a dependent variable.

The following are some of the key terms relevant in understanding experimental research design.

1. **Variable**—a characteristic that can have different values (as opposed to a constant like *pi*, which has one specific value)

2. **Independent variable**—the variable that is applied on purpose (or manipulated) by the Action Researcher, also known as the *intervention, treatment*, or *cause*. As the experimenter, you have the "power" to decide what intervention or treatment to implement and to whom.

3. **Dependent variable**—the variable that is expected to change as a result of the implementation of the intervention or treatment, also known as the *effect*. This variable in experimental studies must be *quantitative*. Examples of quantitative dependent variable are test scores and grades.

4 **Extraneous variable**—the variable that might *differentially* affect the dependent variable or the relationship between independent and dependent variables if not controlled

5 **Experimental group**—the group that receives the intervention or treatment, also known as *treatment group*

6 **Control group**—the group that does *not* receive the intervention or treatment

7 **Randomization**—the process of selecting participants for a study such that all members of the sampling space or pool of participants have *equal* chance of being included

When experimental and control groups are used, it must first be established that the two are equivalent prior to the experiment, so that any change in the experimental group can only be attributed to the intervention or treatment and to no other factor.

The following chart shows examples of independent and dependent variables that can be used in experimental Action Research. See if you can specify the missing dependent or independent variables. Be sure to give different variables.

**Table 3.1.1** Independent variable–dependent variable chart

| Pairs | Independent variables | Dependent variables |
|---|---|---|
| 1 | Instructional method:<br>cooperative learning vs. traditional learning | |
| 2 | | Quarterly grades |
| 3 | Type of in-school breakfast:<br>protein-rich vs. high carbohydrates | |
| 4 | | Length of attention span |

## TYPES OF EXPERIMENTAL DESIGNS

There are three types of experimental designs: *pre-experiments*, *quasi-experiments,* and *true experiments*. All of them involve manipulation of an independent variable to see its effect on a dependent variable. However, they differ in the additional features of having a control group and the use of randomization in the selection of participants. Only pre-experiments do *not* have a control group while only true experiments employ randomization in selecting participants.

**Table 3.1.2.** Three types of experiments

| Pre-experiment | Quasi-experiment | True Experiment |
|---|---|---|
| Manipulation of independent variable | Manipulation of independent variable | Manipulation of independent variable |
| No random assignment of participants | No random assignment of participants | Random assignment of participants |
| No control group | May or may not have control group | Has control group |

Among the three types of experiments, the pre-experimental and quasi-experimental designs are more commonly used for Action Research because the experiments are conducted in the teachers' classrooms.

## SAMPLING METHOD

Technically, it is advantageous if sampling for experiments is *random*. In the case of Action Research though, the intervention is implemented to address specific classroom problems; hence, the sampling should be *purposive* and *accessible*. Participants should be students in particular classrooms where problems are to be addressed by specific interventions.

## DATA COLLECTION METHODS

Experiments require numerical data; hence, paper-and-pencil instruments are the usual data collection methods. These include teacher-made tests, rating scales, and checklists. Observation and documents, such as portfolios, may also be used as long as data derived from these can be transformed to numerical values.

## DATA ANALYSIS TECHNIQUES

The following are the two common statistical techniques applied on data collected for experimental action research.

1. *Descriptive statistics*
   - a. *Measures of central tendency or location*—mode, median, and mean
   - b. *Measures of variability or dispersion*—range, variance, and standard deviation
2. *Inferential statistics*
   - a. *Independent t-test*—used for comparison of two means obtained from two different groups (e.g., experimental and control groups)
   - b. *Paired t-test*—used for comparison of two means from one group that is measured twice (e.g., pretest and posttest)
   - c. *Analysis of Variance (F test)*—used for comparison of three or more groups or means (e.g., sections A, B, and C of Grade 1)

Sampling, data collection methods, and data analysis techniques will be discussed in detail in the succeeding sections.

## PRACTICE/EXERCISE

The following table contains three examples of experiments. See if you can determine the correct type of experiment applied by examining the presence of a control group and the use of randomization in the selection of participants. Be guided by the discussion earlier on the characteristics on each type of experiment

| | Description of study | Variables | Use of control group | Use of randomization | Type of experiment |
|---|---|---|---|---|---|
| 1 | Teacher A used advanced organizers in Grade 6 Science to improve student achievement in Section Mabini. Section Quezon was not given advanced organizers. The scores of the two sections in long quizzes were compared. | | | | |
| 2 | Teacher B used Peer-Assisted Learning Strategies (PALS) to improve the performance of the bottom 33% of her class. To assess the effectiveness of PALS, scores before and after their implementation were examined. | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 3 | To find the effectiveness of scaffolding, English Coordinator C randomly selected two of twelve heterogeneous sections of Grade 7 in a large school and assigned them to one of two conditions: one where scaffolding was used for every lesson and another where no scaffolding was applied. Their scores in the long examinations were evaluated. | | | | |

Check your responses to this exercise against the suggested responses provided at the end of this section.

## REFERENCES


Harris, A. D., D. D. Bradham, M. Baumgarten, I. H. Zuckerman, J. C. Fink, and E. N. Perencevich. 2004. "The Use and Interpretation of Quasi-Experimental Studies in Infectious Diseases." *Clinical Infectious Diseases* 38, no. 11 (June): 1586–91. Accessed November 14, 2018. https://www.ncbi.nlm.nih.gov/pubmed/15156447.

Heffner, C.L. n.d. "Pre-Experimental Design." AllPsych (website). Accessed November 14, 2018. https://allpsych.com/researchmethods/preexperimentaldesign/.

Wilhelm, Doug. 2012. "Experimental Design Notes." Youtube (website). Accessed November 14, 2018. https://www.youtube.com/watch?v=UN206cSaF0k.

Onderzoeksmethoden UvA. 2017. Quasi-Experimental Designs. Youtube (website). Accessed November 14, 2018. https://www.youtube.com/watch?v=GwvjXW2WIsU.

Research Methods. 2016. "True, Quasi, Pre, and Non-Experimental Designs." Youtube (website). Accessed November 14, 2018. https://www.youtube.com/watch?v=gciQ2TEneWM&pbjreload=10.

UTSA Libraries. 2011. "True Experiment." Youtube (website). Accessed November 14, 2018. https://www.youtube.com/watch?v=x2i-MrwdTqI.

The following table will help enrich your understanding of the three types of experiments.

| Pre-experimental design | Quasi-experimental design | True experimental design |
|---|---|---|
| • One shot case design<br>• One group pretest-posttest design<br>• FEATURES<br>  • Manipulation of independent variables<br>  • Limited control over the extraneous variables<br>  • No randomization and control group | • Non-randomized block design<br>• Time series design<br>• FEATURES<br>  • Manipulation of independent variables<br>  • Absence of either randomization/control group | • Posttest only control design<br>• Pretest-posttest<br>• Factorial design<br>• Randomized block design<br>• Cross over design<br>• FEATURES<br>  • Manipulation of independent variable<br>  • Presence of control group<br>  • Randomization |

**source:** Kavitha Prabakar, Slideshare (website); https://www.slideshare.net/kavithaprabakar37/experimental-design-34014840

## EXAMPLE OF PRE-EXPERIMENT

| Types of pre-experimental design | |
|---|---|
| • The One-Shot Case Study<br>• A single measure is recorded after the treatment is administered.<br>• Study lacks any comparison or control of extraneous influences.<br>• To remedy this design, a comparison could be made with another group.<br>• Diagrammed as | |
| x<br>New textbook | o<br>Attitude scale to measure interest |

**source:** https://www.google.com/search?biw=1024&bih=606&tbm=isch&sa=1&ei=jdAYW4yXA8m_0QTO1ZuYBw&q=pre-experiments+illustration&oq=pre-experiments+illustration&gs_l=img.3...113010.115785.0.116556.14.11.1.0.0.0.322.1586.0j2j4j1.7.0....0...1c.1.64.img..6.0.0....0.j1jEvDJfPOk#imgrc=heinGhx7NagKIM

## SAMPLE RESPONSES TO THE INDEPENDENT VARIABLE-DEPENDENT VARIABLE CHART

| Pairs | Independent variables | Dependent variables |
|---|---|---|
| 1 | Instructional method: cooperative learning vs. traditional learning | *Achievement test scores* |
| 2 | Type of learning material: digital vs. print | Quarterly grades |
| 3 | Type of in-school breakfast for Grade 1: protein-rich vs. high carbohydrates | *Weight after 3 months* |
| 4 | Teaching aid: videos vs. photos | Length of attention span |

## SAMPLE RESPONSES TO EXERCISE ON TYPES OF EXPERIMENTS

| Description of study | Variables | Use of control group | Use of randomization | Type of experiment |
|---|---|---|---|---|
| **1** Teacher A used advanced organizers in Grade 6 Science to improve student achievement in Section Mabini. Section Quezon was not given advanced organizers. The scores of the two sections in long quizzes were compared. | *Independent variable:* Use or nonuse of advanced organizers<br><br>*Dependent variable:* Scores in long quizzes | Yes | None | Quasi-experiment |
| **2** Teacher B used Peer-Assisted Learning Strategies (PALS) to improve the performance of the bottom 33% of her class. To assess the effectiveness of PALS, scores before and after their implementation were examined. | *Independent variable:* Application or non-application of PALS<br><br>*Dependent variable:* Scores before and after PALS | None | None | Pre-experiment |
| | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **3** | To find the effectiveness of scaffolding, English Coordinator C randomly selected two of twelve heterogeneous sections of Grade 7 in a large school and assigned them to one of two conditions: one where scaffolding was used for every lesson and another where no scaffolding was applied. Their scores in the long examinations were evaluated. | *Independent variable:* Implementation or non- implementation of scaffolding<br><br>*Dependent variable:* Scores in long examinations | Yes | Yes | True Experiment |

SESSION 3.2

# DESIGNING A QUALITATIVE ACTION RESEARCH

# OBJECTIVES

At the end of this section, the reader will be able to:

1. explain what qualitative research is and its three types;
2. recognize Action Research topics that require qualitative research method;
3. identify techniques for data collection in qualitative Action Research; and
4. describe how data in qualitative research are analyzed.

# INTRODUCTION

Study of interventions or treatments applied to solve problems and issues in the classroom as identified by teachers can be carried out using *qualitative research design*. Questions asking how students responded to an intervention or treatment or what effects were experienced by participants when the intervention or treatment was implemented are suitable for exploration through qualitative Action Research. Experiments also seek to find the effectiveness of an intervention or treatment, but the variables chosen as evidences for improvement are numerical or quantitative such as test scores and grades. Qualitative Action Research is also interested in examining positive results as a consequence of instituting an intervention or treatment, but the variables of interest are more *descriptive* and *narrative* in nature.

This section will focus on describing the qualitative Action Research design, the types of questions that are appropriately addressed using it, and the methods used for data collection and analysis.

# STEPS/KEY CONCEPTS

## UNDERSTANDING QUALITATIVE ACTION RESEARCH

Qualitative Action Research in education is:

- aimed at understanding some aspect of the students' lives and experiences in school, particularly in relation to an intervention or treatment implemented to address a problem or issue;
- used to gain insights about underlying sentiments, thoughts, reasons, opinions, and motivations of participants in order to describe the effect of an intervention or treatment. These insights may consequently evolve into a hypothesis that may be examined using quantitative Action Research in the future;

- also useful in stage 1 of the Action Research Framework, "Assessing the situation." Through it, a practitioner may uncover trends in thought and opinions about a problem or issue, which can lead him or her to conceptualize an intervention or treatment, paving the way for Action Research; and
- conducted to generate words and "thick" descriptions and narratives, rather than numbers, as data for analysis (Patton and Cochran 2002).

Qualitative methods for Action Research are used when aiming to answer questions about the 'what' or 'how' of an intervention or treatment during its institution or after its implementation, as opposed to questions about 'how many' and 'how much,' which are answered by experimental methods.

The nature of qualitative research is it...

- focuses on how students look at or feel about their experiences with the intervention or treatment as implemented in the classroom;
- describes in detail the classroom phenomenon before, during, and after intervention or treatment by portraying the real-world classroom context;
- studies the effect of intervention or treatment using students' narrative accounts as data;
- uses thematic analysis of narrative reports of experiences; and
- employs the systematic Action Research process with more flexibility such that the procedures are "emergent."

## TYPES OF QUALITATIVE RESEARCH

The following are the three types of qualitative research methods that can be used for Action Research.

### 1 Case study

- This involves a deep understanding of one individual or one class through multiple types of data sources. It can be *explanatory*, *exploratory*, or *descriptive* of an individual student or an entire class after an intervention or treatment has been applied.
- One example of a case study is that of one pupil with learning difficulties who is given individualized instruction in order to enable him or her to reach the minimum level of performance. The intervention is applied only to one learner; therefore, the case study is only on him or her.
- A learning material with exercises may also be introduced to one class to examine how students will respond to it. In this situation, the case study is on the whole class instead of on just one student.

## 2 Ethnographic study

- In this type of study, the Action Researcher probes participants through *immersion* (spending lengthy interactions with them in their natural environment) to understand how an intervention or treatment may have changed their objectives in life, their way of life, their way of addressing personal problems, and their reasons for doing things.
- Ethnography is an excellent way of investigating the effect of an intervention or treatment whose purpose is to address a problem or issue that is connected with the students' home or community.
- As a preliminary way of "uncovering unmet needs" of students with academic difficulties (stage 1 of the Action Research framework, "Assessing the situation"), the teacher may wish to literally and figuratively "follow them home" and observe them. In doing this, the teacher may find out how these students live from day to day and may identify factors that can be altered to address their difficulties. An intervention or treatment can then be planned to help meet some of these needs.
- Like in any other type of qualitative research, the teacher-investigator in an ethnographic study does not have to come up with a hypothesis to be tested; instead, he or she merely takes in what he or she observes about the student participants.

## 3 Phenomenological study

- This examines student experiences (called "lived experiences") through their own descriptions. The goal of this type of study is to describe the meaning that experiences hold for each individual participant. This is suitable for topics in which there is little knowledge (Donalek 2004).
- Any intervention or treatment developed to address a specific issue can be tentatively applied using this type of qualitative research (similar to how a case study or an ethnographic study might be conducted) prior to its full implementation for groups of learners.
- Suppose you have some students in your Grade 10 class who are sometimes absent because of their work or their domestic responsibilities. You are thinking of giving them modules to take home when their work or responsibilities prevent them from attending class. You may first examine which students will benefit most from the modules. Thus, phenomenological study can be used in "Assessing the situation" (stage 1 of the Action Research framework) prior to the giving of modules.

- Let us say that after much thought and planning, you decide to give the modules to two male students who are both working and one female student who is a first-time mother to her 3-month old baby. You chose them because all three students have shown interest in studying the modules and are living close to each other. You meet with them in their homes on a Saturday when they do not show up for class the past week to discuss the reasons for their absence and to see if the modules have been helpful to them. You also interview them some more about their work and domestic responsibilities and observe their environment during your visit. In this case, you are already applying phenomenological study as the approach for your Action Research.

## SAMPLING METHOD

The following are the sampling methods commonly utilized in the conduct of qualitative Action Research.

1. *Purposive* and *accessible sampling* is typically applied in qualitative Action Research wherein participants are students in the classroom where a teacher implements his or her intervention. Purposive sampling is a type of nonprobability sampling in which the units to be observed are selected on the basis of the researcher's judgment about which ones will be the most useful or representative.
2. *Snowball* (or *referral*) *sampling* is occasionally used in interview. It is utilized in situations wherein the entire list of participants is not available or known. The Action Researcher may know only a few who can provide the data for the study, and, eventually can "refer" the succeeding interviewees.
3. *Quota sampling* is utilized when the Action Researcher wants a sample that "represents" the distribution of students in the population. For example, if in a class of forty students, one-fourth are boys and three-fourths are girls, a sample of twelve (n = 12) students will include 9 girls and only 3 boys.

## DATA COLLECTION METHODS

Some of the common methods of data collection for qualitative research are the following:

1. **Individual interview**

   This involves one-on-one direct asking of questions to participants, about their experiences during the implementation of the intervention or treatment. An interview guide may be used to make sure that no question is missed. Main

questions may be supported by probe questions. Major questions should be open-ended and non-leading. Questions that are answerable by "Yes" or "No" should be avoided.

### 2 Focus Group Discussion (FGD)

In FGD, data are collected through an interview conducted within a group of participants who have received the intervention or treatment. This is suitable if the Action Researcher wishes to collect data from as many participants as possible within a short period of time. This allows participants to share their thoughts, opinions, perceptions, and feelings about the intervention or treatment and compare these with those of others. Ideally, FGDs should have between 6 to 10 participants to be effective.

### 3 Participant observation

This is the type of observation wherein it is assumed that the Action Researcher collects the data from a classroom in which he or she "participates" as the implementer of the intervention or treatment. By watching and listening to the participants, the Action Researcher discovers how they feel, interact, relate, and behave when the intervention or treatment is implemented. Observations may be recorded using pen and paper or electronic recording device.

### 4 Documents and materials

These refer to documents and materials that may be used as relevant data for qualitative research. Examples of these are students' written work and projects. If an intervention or treatment is intended to develop the ability to communicate or illustrate what one knows, student portfolios and material outputs of projects may be the appropriate data sources.

### 5 Open-ended questionnaire

Occasionally, when both interview and observation are not possible and when there are neither documents nor materials that can provide the required data for a qualitative Action Research, the teacher-investigator may directly seek the information through an open-ended questionnaire. Participants may express their sentiments, thoughts, opinions, views, and similar reactions through an open-ended question or set of questions that require self-constructed responses. They may be asked to answer questions like "What are the effects of the intervention or treatment on your study habits?"

## DATA ANALYSIS

*Thematic analysis* is one of the most common forms of analysis in qualitative research. Patterns (or *themes*) found within the data are identified and examined. Three to five themes should be sufficient to describe and categorize respondents' thoughts, opinions, perceptions, and feelings about the intervention or treatment they experienced. The qualitative Action Research question is answered by enumerating and explaining these themes and by giving examples of corresponding specific responses. Frequencies and percentages for each theme may also be derived, which may then be displayed in tables or graphs.

Sampling, data collection, and data analysis methods for qualitative Action Research will be discussed in detail in the next sections of this guide covering these topics.

**Table 3.2.1.** Sample data analysis for qualitative research

| Themes | Sample Responses | Frequency | Percent (%) | Rank |
|---|---|---|---|---|
| 1. preparation for lesson | Nakatulong ang GO para maihanda ang isip ko sa itututuro ni teacher (09) | 2 | 20 | 2.5 |
| 2. clarification of lesson | Naging malinaw ang tinuturo ng teacher dahil sa GO (02) | 2 | 20 | 2.5 |
| 3. increase of student comprehension | Mas natutunan ko ang lesson dahil sa binigay na GO ni teacher (04) | 5 | 50 | 1 |
| 4. confusion | Medyo nalito ako sa GO kasi iba yung ginamit na words kaysa sa book (08) | 1 | 10 | 4 |

## PRACTICE/EXERCISE

Without looking at your notes from the discussion earlier, match the descriptions provided in column A with the corresponding term listed in column B. You may choose a term once, more than once, or not at all. Write your answers on the space provided before each number.

| Column A | Column B |
|---|---|
| _____ 1. focuses on the meanings of "lived" experiences | A. case study |
| _____ 2. examines one student or one class in depth | B. documents and materials |
| _____ 3. interviewing several participants at one time | C. ethnography |
| _____ 4. watching own class to collect data | D. focus Group Discussion (FGD) |
| _____ 5. conducting study by "immersing" oneself in the participants' natural environment | E. interview |
| | F. participant observation |
| | G. phenomenological study |
| | H. qualitative data |

You may check your answers against the *Answer Key* provided at the end of this section.

Read the following situation then answer the questions that follow to be able to come up with a possible qualitative Action Research.

You are the teacher assigned to an elective photography class for Grade 10 students. Thirty (n = 30) students came for your first meeting. However, by the fourth meeting, the class attendance has dwindled to about half (n = 17). You want to find out what happened to the 13 students who kept on missing the class. Let us say you want to use qualitative research design for this study. Answer the following questions regarding the problem situation.

1 How would you go about executing the stage 1 of the Action Research framework, "assessing the situation"?

_____

_____

2 What might be some of the reasons for the absence of the students?

_____

_____

3 Based on these reasons, what type of intervention or treatment would you implement to encourage the missing students to continue attending your class?

4 What type of qualitative research will you use for this study and why?

5 What would be an appropriate Action Research question for your study? Be sure to mention in your research question the intervention or treatment you plan to implement and the change that you expect to see.

6 How would you go about conducting this study, particularly in implementing the intervention or treatment?

7 What data would you collect for the study? How would you collect such data?

8 How would you analyze the data that you would collect for this study?

9 What themes do you think would emerge from the data? Think of three to five themes.

**10** What conclusion do you hope to derive from the study?

_____

_____

## REFERENCES


Donalek, J. G. 2004. "Demystifying Nursing Research: Phenomenology as a Qualitative Research Method." *Urologic Nursing* 24, no. 6: 516–517.

Hancock, Beverly, Elizabeth Ockleford, and Kate Windridge. 2009. *An Introduction to Qualitative Research*. United Kingdom: The NIHR RDS for the East Midlands/The NIHR RDS for Yorkshire and the Humber.

Patton, Michael Quinn and Michael Cochran. 2002. *A Guide to Using Qualitative Research Methodology*. Paris: Médecins Sans Frontières.

Sauro, Jeff. 2015. "5 Types of Qualitative Methods." Measuring U (website). Accessed November 14, 2018. https://measuringu.com/qual-methods/.

Yong, Bridget and Darko Hren. (nd). "Introduction to Qualitative Research Methods" (slide presentation). Methods in Research on Research (website). Accessed November 14, 2018. http://miror-ejd.eu/wp-content/uploads/sites/34/2017/03/Introduction-to-qualitative-research-methods.compressed.pdf.


## NOTES/SIDEBAR

What are the things to remember about qualitative Action Research?

### A Characteristics of qualitative research

- The aim is to describe sentiments, thoughts, opinions, attitudes, feelings, reactions, and similar traits of participants after an intervention or treatment is implemented.
- The sample size is typically small and purposively chosen.
- Sometimes, respondents are selected to fulfill a quota for sample size.
- Data collected come in the form of descriptions and narratives.
- Thematic analysis is a method of summarizing data collected for qualitative research.
- There are three common types of qualitative research that may be used for Action Research: case study, ethnographic study, and phenomenological study.

**B Ethical issues in qualitative research**

- *Informed consent*—appraising participants of the purpose for the study, and of any possible risk or harm on their part and allowing them to decline participation if they wish
- *Confidentiality*—ensuring that participants' identities and whatever information they give will be kept in utmost confidence

**C Things to avoid in conducting interviews**

- influencing responses by asking leading questions or conveying one's own views, whether implicitly or explicitly
- asking the question "Why?"
- asking about other people (e.g. "How do your fellow students perceive…?")
- moving too quickly from one topic to another
- interrupting the interviewee while he or she is responding

# ANSWER KEY

## PRACTICE/EXERCISE

**1** G

**2** A

**3** D

**4** F

**5** C

SECTION 3.3

# DESIGNING CAUSAL-COMPARATIVE STUDY FOR ASSESSING THE SITUATION

(STAGE 1 OF THE ACTION RESEARCH FRAMEWORK)

## OBJECTIVES

At the end of this section, the reader will be able to:

1. identify the essential characteristics of causal-comparative research as an approach to "assessing the situation" (stage 1 of the Action Research framework);
2. specify data collection methods and data analysis tools for causal-comparative research;
3. construct research questions that are appropriately addressed by causal-comparative research; and plan procedures for collecting and analyzing data for given causal-comparative research questions.

## INTRODUCTION

In this section, you will learn about *causal-comparative research* (also known as *ex-post facto research*) as one of the methods you can use in "assessing the situation," the stage 1 of the Action Research framework.

Causal-comparative research is conducted if you suspect that there might be a causal relationship between certain events (e.g., attendance in Preschool) and a supposed effect (e.g., school readiness).

Let us say you are a Kindergarten teacher and you notice that certain pupils are able to adjust to formal school right away. You find out that these pupils had attended Preschool prior to Kindergarten. You then hypothesize that Preschool education helps develop school readiness among young learners.

In order to substantiate your suspicion, , you raise the research question "what is the effect of preschool education to school readiness among young learners?". You may conduct a causal-comparative research comparing Kindergarten pupils in your class who have had Preschool education with those who have none. You may administer a short school readiness test to both groups. When the results are compared, you may then find out if the pupils who have attended Preschool have more personal and social skills related to school readiness. If that is the really the case based on the results, then you may conclude that they are more "school ready" than those who have not attended Preschool.

Results of such a study may guide you to develop and implement an intervention or treatment that might help those who have not attended Preschool to be able to adjust to formal school setting within the next three months of enrollment in Kindergarten. You may then proceed to the implementation of the intervention or treatment through Action Research.

# STEPS/KEY CONCEPTS

## UNDERSTANDING CAUSAL-COMPARATIVE RESEARCH

- *Causal-comparative research* is one of the three research designs that may be used in "Assessing the situation" (stage 1 of the Action Research framework). The other two are Correlational Research and Survey Research, which will be discussed in the next sections.
- This research design attempts to find possible *causal* relationship between a presumed independent variable and a presumed dependent variable, *after* an action or event has already occurred.
- As in the example about Kindergarten pupils, the "action," "event," or presumed "cause" (Preschool education) has already happened. This supposed independent variable can no longer be manipulated, as it has already occurred. Even if it can be manipulated, it will run counter to ethical practices. We cannot "randomly assign" young children to two groups where one group will be asked to enroll in Preschool and the other group, not. Hence, the best approach to explore the *supposed* causal relationship between Preschool education and school readiness is through causal-comparative research.
- Because the supposed independent variable has already occurred in the past and the study is conducted "after the fact," causal-comparative research is also called ex-post facto research (Best and Khan 1993). "The condition (Independent Variable) already existed before the researcher even arrived" (Maheshwari 2018).

## VARIABLES IN CAUSAL-COMPARATIVE RESEARCH

Possible independent variables in causal-comparative research include any factor, trait, or condition that already exists. These variables cannot be manipulated because they have already occurred. In some cases, these cannot be manipulated for ethical reasons.

The following are some hypothesized independent variables whose effects may be explored in causal-comparative research.

1. sex (male and female)
2. grade level (Grade 6 and Grade 10)
3. achievement level (Superior, Upper Average, Lower Average, Poor)
4. educational level (Elementary level, Elementary Graduate, High School level, High School graduate, College level, College graduate)

5 municipality income type (1st class, 2nd class, 3rd class, 4th class, and 5th class)
6 school type (Primary, Central ES, Non-Central ES)
7 size of school (small, medium, large)
8 city/municipality category (urban, partially urban, rural)

## CONDUCTING CAUSAL-COMPARATIVE RESEARCH

- Causal-comparative research is one of the methods that teachers can use to conduct preliminary study to explore possible causes of and tentative solutions to a problem or issue in the classroom. It is one of the designs that are applied in "Assessing the situation" (stage 1 of the Action Research framework) before implementation of an innovation as treatment in an Action Research.
- Findings obtained from causal-comparative research can provide insights into the classroom problem or issue. These can also lead the Action Researcher to the kind of mediation that can address it.
- Causal-comparative research, then, is conducted as a starting point for Action Research. It is performed before an experimental research or qualitative research is pursued, during which an intervention is implemented.

## FROM CAUSAL-COMPARATIVE RESEARCH TO EXPERIMENTAL (QUANTITATIVE) OR QUALITATIVE ACTION RESEARCH

An Action Research using either experiment (quantitative) or qualitative research design may be pursued if the results of a causal-comparative research have ascertained that there are students who really need help and have suggested that some form of remediation will be beneficial.

Suppose a Grade 2 teacher computes mean scores in each subject after the first periodical examination and discovers that in Mathematics, the mean percentage score (MPS) for the entire class is around 45, which is five points lower than the target 50 MPS. He or she then instinctively contemplates on implementing an intervention that he or she has used before. To decide if the intervention session should be conducted for the entire class or for a small group, she pursues a causal-comparative study comparing boys and girls in Mathematics. The statistical analysis indicates that on the average, boys (mean = 32) scored significantly *lower* than girls (mean = 48). The teacher then resolves to first provide the intervention to a small group of boys who scored lowest in the examination.

## SAMPLING METHOD

When the population of students is large enough, *random sampling* method can be applied provided that there are at least thirty (n = 30) for each group to be compared.

Non-random sampling, such as *purposive* or *accessible* sampling, is also acceptable for causal-comparative research.

## DATA COLLECTION METHODS

Causal-comparative research is a quantitative research that requires numerical data. Some of the *paper-and-pencil instruments* that can be used for data collection are as follows:

1. standardized tests and teacher-made tests
2. rating scales, such as Likert scales and Likert-type scales
3. checklists
4. psychological tests, such as personality inventories

*Documents* may also be used as sources of data for causal-comparative research. These include teachers' class records and data obtained from the DepEd's database (E-BEIS).

## DATA ANALYSIS TECHNIQUES

The following are the data analysis techniques that can be utilized in casual-comparative research:

1. **Independent t-test**—This is applied to data obtained from *two* groups (e.g., boys and girls) in order to decide if their means are significantly different. For example, let us say we want to compare the school readiness of Kindergarten pupils who attended Preschool and those who did not. We will then use the independent t-test to find out if the two groups of Kindergarten pupils differ in school readiness.
2. **F-test or ANOVA**—This is used when there are *three* or *more* groups to be compared. For example, we may have three types of Preschools: one conducted in the barangay day care, another one provided by a nongovernment organization (NGO), and another one which is a private school. We can compare if Kindergarten pupils who attended the different types of Preschools differ in school readiness. The F-Test or Analysis of Variance (ANOVA) is the appropriate statistical technique to be used in comparing the three groups of Kindergarten pupils.

Statistical significance will tell us if the differences found in the samples are true of the populations that they represent.

Take note that the statistical procedures above are introduced here as part of the discussion on causal-comparative research. These will be discussed more in the succeeding sections of this guide.

## PRACTICE/EXERCISE

Formulate a causal-comparative research by choosing variables from the following box. Select one independent variable and one dependent variable.

| Independent variable | Dependent variable |
|---|---|
| • sibling rank – *eldest*, *middle*, *youngest*, *only child*<br>• mother tongue – *Filipino, not Filipino*<br>• learning style – *visual*, *tactile*, *others*<br>• mode of transportation to school – *walking*, *family vehicle*, *school bus*, *public transport* | • attitude toward school<br>• time spent for studying<br>• performance rating |

Answer the following questions.

1 What could be a proper causal-comparative research question for the variables that you have selected? Write it below.

2 How will you collect data for your causal-comparative research based on the variables you have chosen?

3 What statistical technique will you use to compare the groups in your causal-comparative research?

4 What conclusion do you wish to derive from your causal-comparative research?

5 Suppose your findings from the causal-comparative research are significant, what will you do next?

6 How does your causal-comparative research help you "assess the situation" (stage 1 of the Action Research framework)?

7 What might be your Action Research about following the results of the causal-comparative research?

# REFERENCES

Best, John W. and James V. Kahn. (1959) 1993. *Research in Education.* Needman Heights, MA: Allyn & Bacon.

Maheshwari, V. K. 2018. "Causal-Comparative Research." Dr. V. K. Maheshwari, PhD. (website). Accessed May 14, 2018. www.vkmaheshwari.com/WP/?p=2491.

SECTION 3.4

# DESIGNING CORRELATIONAL RESEARCH FOR ASSESSING THE SITUATION

(STAGE 1 OF THE ACTION RESEARCH FRAMEWORK)

# OBJECTIVES

At the end of this section, the reader will be able to:

1. describe the important features of correlational research as preliminary research for Action Research;
2. plan for a correlational research, including the formulation of a correlational research question, the selection of participants, and the collection and analysis of data; and
3. conceptualize an intervention or treatment that can be implemented based on findings about the relationship between variables generated through correlational research.

# INTRODUCTION

Correlational research is one of the adjunct research designs that can be used in "assessing the situation" (stage 1 of the Action Research framework) prior to the implementation of an intervention or treatment for Action Research.

In this section, you will learn what correlational research design is, what its elements are, and how it works.

## STEPS/KEY CONCEPTS

### UNDERSTANDING CORRELATIONAL RESEARCH

*Correlational Research* is primarily pursued for the purpose of describing relationships between or among variables. These relationships are not necessarily causal in nature. Understanding that two variables are related can help you identify the type of intervention or treatment that you can implement for Action Research. For example, if you know that the more time a student spends doing homework, the higher his or her test scores are, then you may want to manipulate hours for homework in order for him or her to have high test scores.

Questions that ask about descriptions of relationship between variables in terms of magnitude and direction may be answered by correlational research. An example of a correlational research question is: "What is the nature of relationship between variables X and Y in terms of intensity and direction?"

## KEYS TERMS IN CORRELATIONAL RESEARCH

The following are some of the terms that are necessary to the understanding of correlational research.

1. *Predictor variable* is the variable that can be used to predict another variable. It is the variable from which projections about the criterion variable come from. It is usually designated as variable X.
2. *Criterion variable* is the variable that can be predicted using predictor variable variable X. It is usually designated as variable Y.
3. *Intensity* refers to the strength of the relationship between variables. Some relationships are "strong" others are "weak."
4. *Direction* denotes how the two variables *vary together*. When variable X *increases* and variable Y correspondingly *increases*, the variables are said to have a *direct relationship*. When variable X *increases* but variable Y *decreases*, the relationship is described to be *inverse*.

## SAMPLING METHOD

*Random selection* is preferred when selecting participants for correlational research. This will enable you generalize the findings to the population. However, since correlational research may be used as preliminary investigation prior to an Action Research, most teachers often apply either *purposive* or *accessible* sampling. Correlational research is conducted among their students or students who are *available* to give the data needed. A minimum sample size of at least fifty (n = 50) is advised for correlational research.

## DATA COLLECTION METHODS

Most *paper-and-pencil instruments,* such as tests, rating scales, checklists, personality inventory, and the likes are ideal methods for collecting data for correlational research as preliminary investigation in "assessing the situation" (Stage 1 of the Action Research Framework) prior to Action Research.

You may also look at *documents,* such as your class records, to identify variables that can be investigated in correlational research. Other sources of variables are school records such as those found in the DepEd database for students and student records held by school personnel like the guidance counselor. Permission may have to be sought though from students in your class or school and DepEd authorities in order to have access to student data.

### DATA ANALYSIS TECHNIQUES

The following techniques are applied in analyzing data for correlational research.

1. *Scatterplot (or scatter graph, scatter chart, scattergram, or scatter diagram)*—This is a type of plot or mathematical diagram that uses Cartesian coordinates to display values for two variables, one on the X-axis and the other one on the Y-axis. Each point depicts the *cross-point* of the two variables for one individual. This graph is often used as starting point of analysis because it is a picture of how the two variables are related.
2. *Correlation Coefficient*—This is a statistic referring to the measure of relationship between two variables. It can take a value from 0.0 (no relationship) to 1.0 (perfect relationship) and can be either positive or negative. The table below is a suggested interpretation for values of correlation coefficients.

| Magnitude | Direction |
|---|---|
| 0. 1-0.3—weak relationship<br>0.4-to 0.6—moderate relationship<br>0.7-0.9—strong relationship | Positive—direct; as X increases, so does Y<br>Negative—inverse: as X increases, Y decreases |

3. *Pearson Product-Moment Correlation Coefficient*—This is a statistic that describes the relationship between two variables when both are continuous.
4. *Spearman Rho Coefficient*—This is a statistic that describes the relationship between two variables that are both expressed as ranks.

## PRACTICE/EXERCISE

As a way of applying what you have just learned, plan a correlational research as preliminary study for "assessing the situation" (stage 1 of the Action Research framework). Begin by finding a partner. Together, choose one predictor variable and one criterion variable from the following table.

| Predictor variables | Criterion variables |
|---|---|
| • scores on rating scale for attitude toward school<br>• socio-economic status<br>• scores on school motivation scale<br>• scores in school readiness test<br>• hours spent on studying<br>• scores on self-concept inventory<br>• scores on a self-efficacy rating scale | • aptitude test scores in English, Math, or Science<br>• average in Grade 10<br>• average for all four levels of Junior High School<br>• college entrance test scores<br>• grades in any subject in High School<br>• scores on the National Achievement Test (NAT) |

Based on the variables you have selected, specify the following:

1. correlational research question and hypothesis
2. method for selecting participants and sample size
3. procedure for collecting data
4. procedure for analyzing data
5. tentative conclusion
6. possible intervention or treatment for an Action Research

## REFERENCES

Frankael, Jack R. and Norman E. Wallen. (1990) 2003. *How to Design and Evaluate Research in Education*. Boston: McGraw-Hill.

## NOTES/SIDEBAR

**Tip:** Below are suggested considerations in answering correlational research questions.

1. What is the difference between investigating if an independent variable has an effect on a dependent variable and examining if a relationship exists between them?
2. Which of these two investigations is more important and more useful to teachers in the long run?
3. Can a relationship between two variables be statistically significant and yet have very little practical use for educators? Give an example.
4. In what way does correlational research help a teacher prepare for an Action Research?

SECTION 3.5

# DESIGNING SURVEY RESEARCH FOR ASSESSING THE SITUATION

(STAGE 1 OF THE ACTION RESEARCH FRAMEWORK)

# OBJECTIVES

At the end of this section, the reader will be able to:

1. describe the characteristics of survey research and its purpose in relation to Action Research;
2. distinguish various types of survey research; and
3. design a survey research as preparation for an Action Research.

# INTRODUCTION

Experimental and qualitative research designs have been identified as applicable for Action Research because these provide evidence of effectiveness of an intervention or treatment that a practitioner can implement to solve a classroom problem or issue.

However, aside from experimental and qualitative research designs, there are also research designs that are only used for preliminary investigations or in "Assessing the situation" (stage 1 in the Action Research framework). Among these are causal-comparative and correlational research designs.

Survey research is the third and last design that can be used in "Assessing the situation." Results of survey research can give you, as Action Researcher, an idea on what intervention or treatment may be effective for implementation in order to solve a problem or issue in your classroom. Survey research can also provide initial information on students' reactions or perceptions about an intervention or treatment. If you are thinking of instituting a solution to a problem or issue you have observed in your classroom but are not sure how students might respond to it, you may wish to conduct a survey research first to find out their sentiments.

At the end of this section, you are expected to be able to describe the characteristics of survey research and its purpose in relation to Action Research; distinguish the different types of survey research; and plan a survey research as preparation for an Action Research.

# STEPS/KEY CONCEPTS

## UNDERSTANDING SURVEY RESEARCH

*Survey research* is a research design that involves the collection of information from a sample in order to describe some aspects or characteristics of the general population from which the sample is taken. Characteristics include abilities, opinions, attitudes, beliefs, and knowledge about specific matters.

There is no manipulation of any independent variable in surveys. Therefore, it is not suitable for the implementation of any intervention or treatment. However, it is applicable in "assessing the situation" (stage 1 of the Action Research framework) as a preliminary investigation prior to the conduct of Action Research.

The following are some examples of survey research questions:

1. What are the pupils' perceptions of behavioral problems in the classroom?
2. What are the opinions of Grade 11 students on their experiences in Senior High School?

## TYPES OF SURVEY RESEARCH

The following are two major types of survey research:

1. **Cross-sectional survey** research describes different populations of learners based on samples taken from different age groups or school levels at one single time. For example, in one month, you administer a questionnaire about the use of technology for a group of Grade 2, Grade 5, Grade 8, and Grade 11 students to find out about the level of computer literacy of students with different age groups.
2. **Longitudinal survey** describes a population of learners by studying several samples from it for a period of time. For example, you may administer a questionnaire on study habits right around the middle of the school year to a group of learners from the time they are in Grade 1 up to the time they reach Grade 6. The goal is to be able to trace the development of these habits among young learners. There are three longitudinal survey designs: *trend*, *cohort*, and *panel* studies.
    - **a** In trend study, *different* samples from a general population (e.g., Grade 1 pupils) whose members change across time are examined at different points in time.
    - **b** In cohort study, *different* samples from one specific population (e.g., Grade 1, Batch 2018–2019) whose members do *not change* are appraised at different points in time.
    - **c** In panel study, the *same* sample of individuals is assessed at different times over the course of the research.

## SAMPLING

In survey research, the focus of the study is called the *unit of analysis*. For example, if the study is on individual learners, then the unit of analysis is "student" or "pupil." If the study seeks to describe groups or entire classes, then the unit of analysis is "group" or "class."

The *target population* is the larger group of individuals (e.g., students) from whom the participants in the survey research are selected. For the purpose of generalizing the results to the target population, *random sampling* procedure is favored for survey research. The recommended sample size for survey research is usually large; preferably and if possible, it should be close to one hundred (n = 100).

If survey research is applied for preliminary assessment of the situation, sampling may be done *purposively* and the sample size may be *smaller* than is generally required of survey research.

## DATA COLLECTION

*Paper-and-pencil questionnaire* is the most common method for collecting data for survey research. Through this, a broad range of data can be gathered about the respondents. These include attitudes, opinions, beliefs, values, behavior, and factual knowledge.

The questionnaire can be given through direct administration to a group, through mail or email, or through face-to-face or telephone interview. Each of these modes of administration has its own advantages and disadvantages.

Most questions in survey research are closed ended to facilitate the analysis of data especially if it involves a large sample size. For practical purposes, data collection for survey research can be undertaken in large (by class) or small groups in the classroom. A special training is necessary if using telephone and face-to-face interviews as methods for collecting data in survey research. Standardized surveys are relatively free from several types of errors.

## DATA ANALYSIS

Data collected for survey research can be summarized using frequencies and percentages for each item. Graphs are interesting and often preferred ways of presenting frequencies and percentages.

Descriptive statistics such as mode, mean, and standard deviation are also computed whenever applicable. These are significant statistics for rating scales used in collecting survey research data.

With the availability of computer software such as Microsoft Excell, STATA, R, and SPSS, statistical techniques for determining validity, reliability, and statistical significance can be easily performed. Moreover, computer technology has allowed analysis of multiple variables at the same time.

## PRACTICE/EXERCISE

To help you practice the use of survey research as a preparatory tool for Action Research, try to accomplish the following worksheet.

| WORKSHEET ON SURVEY RESEARCH | |
|---|---|
| **1** | What classroom problem or issue are you currently facing? Briefly describe it. |
| **2** | What intervention or treatment do you think would be able to address this problem or issue? Give details about it. |
| **3** | Before you implement the intervention or treatment, what would you be interested to find out about the students who will be given it? |
| **4** | Design a survey research that will enable you to find out if the intervention or treatment you have in mind will be acceptable and suitable for the intended recipients.<br>**a** survey research question<br>**b** sampling and sample size<br>**c** data collection method<br>**d** data analysis technique/s<br>**e** possible conclusion from the survey research<br>**f** next step after completion of the survey research |

# REFERENCES

Fraenkel, Jack R. and Norman E. Wallen. (1990) 2003. *How to Design and Evaluate Research in Education*. Boston, MA: McGraw-Hill.

Anonymous. n.d. "Survey Research and Questionnaires." Research Connections (website). Accessed May 14, 2018. https://www.researchconnections.org/childcare/datamethods/survey.jsp.

DeFranzo, Susan E. 2012. "The 4 Main Reasons to Conduct Surveys." SnapSurveys (website). Accessed May 14, 2018.https://www.snapsurveys.com/blog/4-main-reasons-conduct-surveys/

# NOTES/SIDEBAR

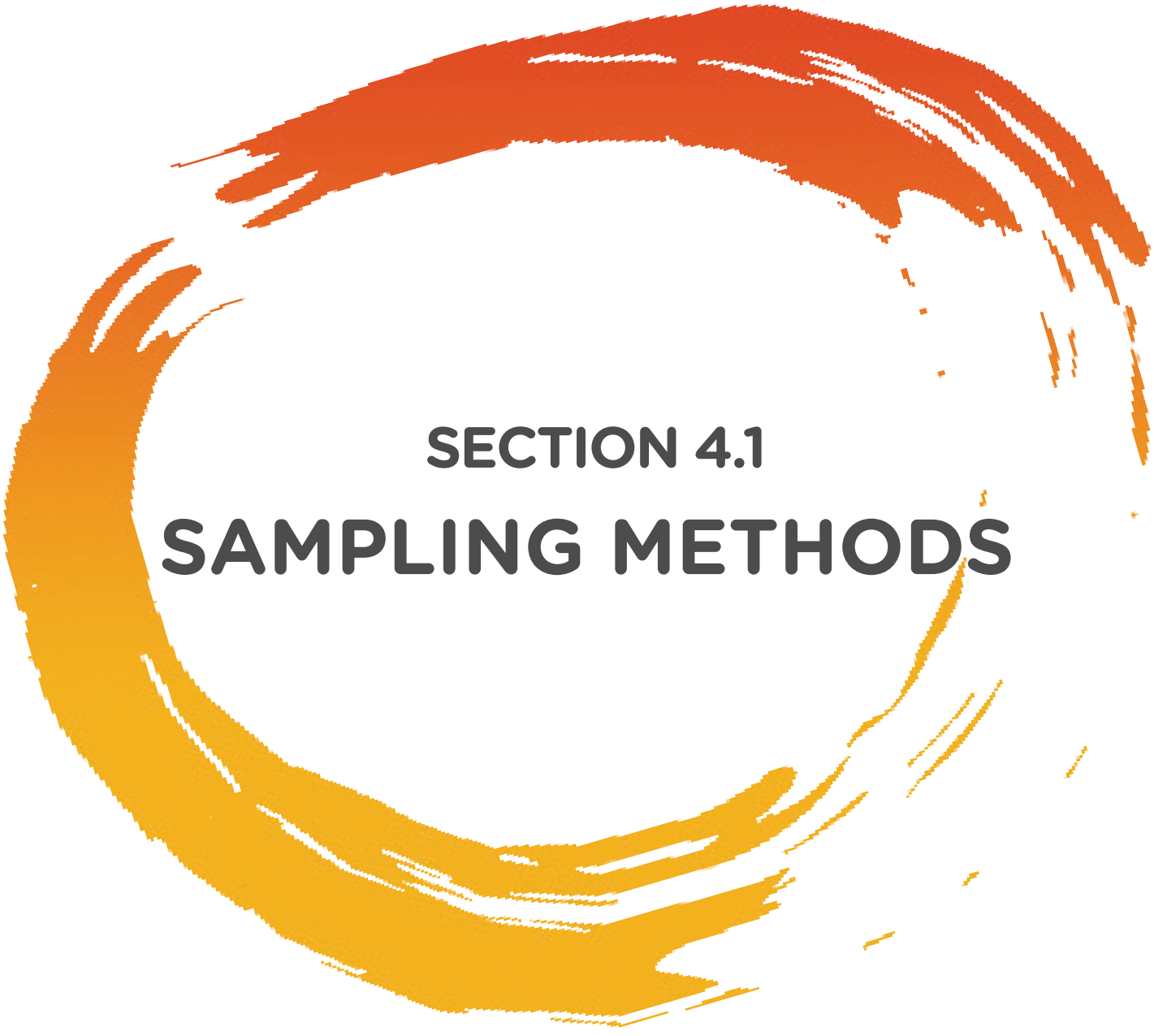
### ADVANTAGES OF QUESTIONNAIRE

- relatively easy to administer
- can be developed in less time compared to other data-collection methods
- generally cost-effective, although this will depend on survey mode
- can be administered remotely; for example, survey can be conducted online through mobile devices, emails, electronic kiosk, or telephone, which reduces or prevents geographical limitations
- data can be collected from a large number of respondents in a short time
- numerous questions can be asked about a topic, giving extensive flexibility in data analysis

### DISADVANTAGES OF QUESTIONNAIRE

Reliability of survey data may depend on:

- whether respondents feel encouraged to provide accurate, honest answers;
- whether respondents feel comfortable providing answers that present themselves in an unfavorable manner; and
- whether respondents are fully aware of their reasons for any given answer because of lack of memory on the subject or even boredom



## SECTION 4.1

# SAMPLING METHODS

## OBJECTIVES

At the end of this section, the reader will be able to:

1. distinguish between random and nonrandom sampling procedures when identifying participants for Action Research or preliminary study;
2. differentiate various random and nonrandom sampling methods; and
3. describe sampling procedures and sample sizes suitable for different research questions.

## INTRODUCTION

A population is a large group of individuals that is usually the focus of research, whether Action Research or preliminary studies. Even if you pursue a study with your own students as respondents, it is possible that your findings can also be useful for others. It is therefore of interest to define the population to which the results of the research can be applied particularly if and when the intervention or treatment is proven to be *effective*.

There are two populations that are referred to in research. First is the *target population* or *theoretical population*. This is the entire group of individuals for which the intervention or treatment is envisioned to be useful as a means of solving a problem or issue.

Second is the *accessible population*. This is a *subset* of the target population. For you as an Action Researcher, it is composed of all the students that you can possibly include in your study. Hence, it is also referred to as the *study population*.

Because a population is generally impractical and impossible to include in research, a *sample* is selected to represent it. The sample is a *subset* of the accessible population that is chosen as participants in an Action Research or preliminary study. It must be *representative* of the population from which it was selected to enable the application of the findings to the population. If an Action Research shows that the intervention or treatment is effective, then the researcher would have more credibility to recommend it to other students if the sample does represent the population of interest.

## STEPS/KEY CONCEPTS

### RANDOM SAMPLING

*Random sampling method* is always desired in selecting participants from the population of interest for Action Research or for preliminary investigation studies. For

example, if an intervention or treatment for developing effective study habits cannot be applied to all students, we can randomly choose a sample of students from our classes or from our school.

Random sampling is the process of selecting research participants from the accessible population so that each member has an *equal* probability or chance of being chosen.

The following are four ways of doing random sampling.

1 **Simple Random**—This is probably the most familiar method of random sampling because we may, in the past, have selected people lottery style at one point or another. The most common procedure is to write each of the names of the members of the accessible population on separate sheets of paper, one name per sheet, and put them in a box or bowl. Without looking, we just pick one name at a time until the required or desired sample size is reached.

   If there are just too many names and it is cumbersome to write all of them on separate sheets of paper, then, one can use a *table of random numbers*. As the name implies, the said table is a book that contains 4- or 5-digit random numbers arranged in 5 rows by columns. To use it, the names of the members of the accessible population have to be listed first in some order, preferably alphabetically. Then, they are numbered consecutively. Once this is done, the table of random numbers can be used in selecting the sample. We can randomly choose the specific column and row from which we begin selecting. Then, we simply go through the list of numbers and choose the individuals associated with the numbers. Most researchers use the digits from the last.

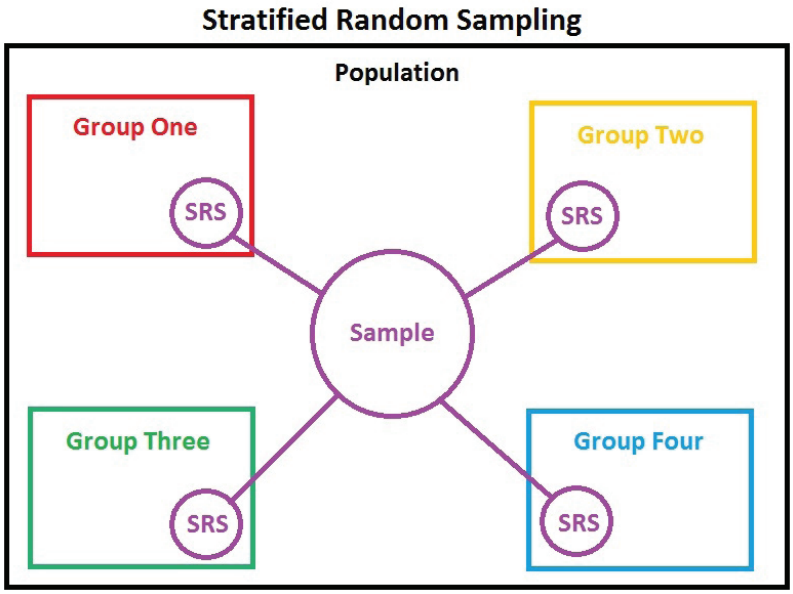
**Part of a Table of Random Numbers**

| | | | |
|---|---|---|---|
| 61424 | 20419 | 86546 | 00517 |
| 90222 | 27993 | 04952 | 66762 |
| 50349 | 71146 | 97668 | 86523 |
| 85676 | 10005 | 08216 | 25906 |
| 02429 | 19761 | 15370 | 43882 |
| 90519 | 61988 | 40164 | 15815 |
| 20631 | 88967 | 19660 | 89624 |
| 89990 | 78733 | 16447 | 27932 |

**Source:** Del Siegle; Neag School of Education, University of Connecticut; https://researchbasics.education.uconn.edu/random-number-table/.

   If you cannot find a table of random numbers, some computers can generate a *set of random numbers*. Names corresponding to the numbers generated may then be chosen to be the sample.

2 **Stratified Random**—In this style of random sampling, the accessible population is first divided into subgroups (strata), such as male and "female. Sample is then taken from each subgroup *proportionately*. For example, in a class of 50 students, there are 35 girls and 15 boys. The proportion is 70:30. We then put the names of the girls and the boys in separate boxes or bowls. If we are selecting 10 students, we first have to choose 7 names from the girls' box or bowl and then 3 names from that of the boys'. In this way, the proportion of the girls and the boys in the sample is the *same* as that in the population from which they are taken.

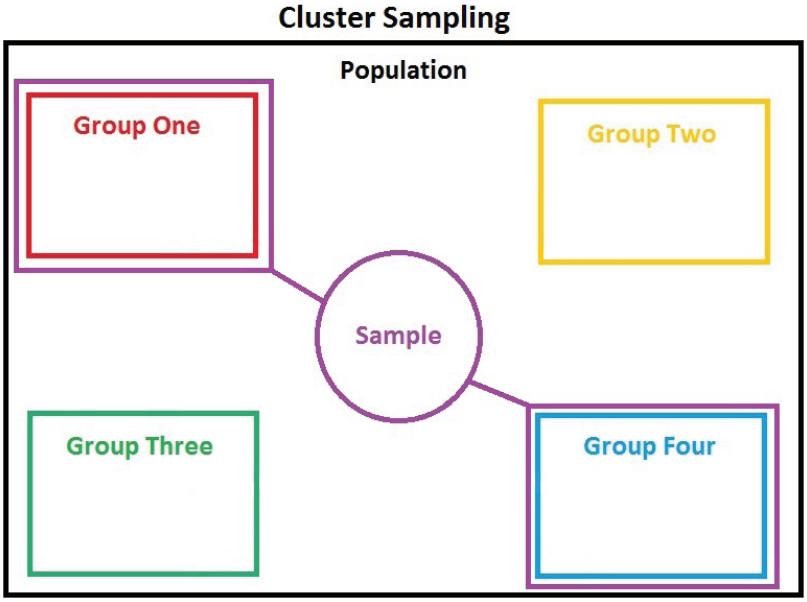



**source:** Wikipedia; https://upload.wikimedia.org/wikipedia/commons/a/a2/StratifiedRandomSampling.jpg

3 **Random Cluster**—*Cluster* refers to *intact groups*. Hence, sampling is done by group, not by individual. As in simple random sampling, groups are given labels or numbers which are then put in a box or bowl. Then, groups are picked randomly from the box or bowl.

For example, we have 8 heterogeneous sections in each grade level from Grades 1–6. We want to apply an intervention on developing good study habits to one section in each grade level. We may then randomly select one section from each grade level. We can simply write the name of each section per grade level on one small sheet of paper and place these in *separate* box or bowl, one box or bowl for each grade level. We may then pick one section from each box or bowl for all the grade levels. The sections we choose would comprise our experimental group with n = 6, where the unit of analysis is section and not individuals.

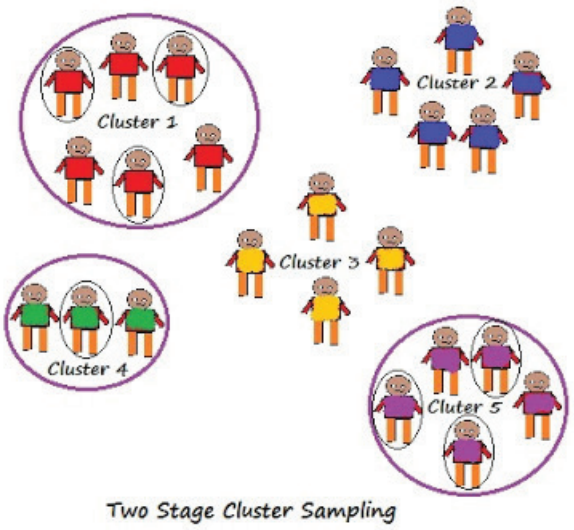
It is assumed that all members of selected groups through random cluster sampling have similar characteristics. This style of sampling is ideal in situations where populations are very large or are distributed across a wide geographical area. In schools, this method of sampling comes naturally and intuitively to teachers because students are organized in classes already.




**source:** Wikipedia; https://upload.wikimedia.org/wikipedia/commons/9/9a/ClusterSampling.jpg

4 **Two-stage or Multi-stage Random**—As the name implies, this random sampling procedure is undertaken in at least *two* stages. First, *clusters* are selected randomly. In the foregoing example, we selected 6 sections with one section from Grades 1–6. This is the first stage. From each of the 6 sections, we then select 5 *pupils*, say 3 girls and 2 boys, to come up with thirty (n = 30) pupils for our sample. This is the second stage.

In larger Action Research projects, the selection process might begin from the division level. For example, ten school *districts* are randomly selected in a division. From each district, one *school* is randomly selected. Then, from each school, one *section* from each *grade* level is randomly selected. Finally, from each section, *individuals* are randomly selected.




**source:** Education Savvy; http://education-savvy.blogspot.com/2015/12/all-types-of-sampling_21.html

## NONRANDOM SAMPLING

In *nonrandom sampling* methods, members of the accessible population do *not* have equal chance of being selected.

The following are some of the nonrandom sampling methods used in research.

1 **Purposive Sampling**—Participants are chosen based on a particular trait that is related to the objectives of the Action Research or preliminary study.

For example, if we want to provide nutritious breakfast for under- or malnourished Kindergarten pupils, we will have to assess the health status of each child first. Then, we select those who are diagnosed as underweight or undernourished. Only those who are diagnosed as such can *qualify* to participate in the breakfast program.


Purposive Sampling

**source:** Research Methodology; https://research-methodology.net/wp-content/uploads/2012/06/Purposive-sampling.jpg

2 **Systematic Sampling** (with a *random start*)—Although often mistakenly classified as belonging to random sampling methods, systematic sampling is more appropriately categorized as nonrandom. That is because once the starting point and the interval have been decided, technically, by virtue of one's position, there is no longer an *equal* chance of being selected as required in random sampling.

In systematic sampling, members of the accessible population are first organized in sequence, alphabetically or in some other way. The Action Researcher then decides on a *periodic interval* to be used in selecting participants. This is computed by simply dividing the accessible population by the desired sample size. For example, if there are 50 students and the Action Researcher only wants to involve 10 of them, the interval is determined by the equation 50/10 = 5. Therefore, the Action Researcher will choose every fifth name on the list.

The researcher can "randomly" choose where to start. Let us say that he or she randomly chooses to start with number 3. Number 3 in the list is then taken followed by numbers 8, 13, 18, and so on until all 10 participants have been selected. If it happens, for one reason or another, that number 18 is unable to participate, the Action Researcher *cannot* take Number 19 to take the place of Number 18. The next participant in the interval, number 23, is then taken. The procedure is followed up to the time all ten (n = 10) participants have been selected.

This method of sampling has three advantages: simplicity, convenience, and easiness.

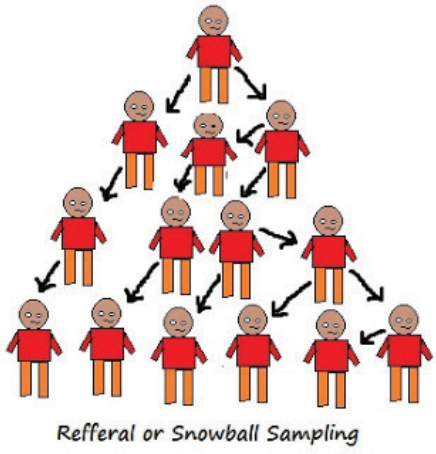

**source:** Elgin Community College; https://faculty.elgin.edu/dkernler/statistics/ch01/images/sys-sample1.gif

3 **Accessible** (also known as *Accidental* or *Convenience*) *Sampling*—Research participants are chosen based on their availability or willingness to be included in the Action Research or preliminary study.

Because the sample is not random and may not truly represent the accessible population, the Action Researcher has some limitations in terms of applying the findings to the population.

4 **Snowball Sampling**—This type of sampling is useful for interviews conducted as preliminary study prior to Action Research. Also known as *referral sampling*, the next interviewees are those that are suggested or *referred* by previous interviewees.

For example, in a preliminary study prior to implementing a counseling program for children of non-traditional family systems, the class adviser may first interview a student who he or she knows to belong to such a family system. The teacher-investigator may then ask the interviewee if he or she might know other students who belong to similar family systems. The list of participants may then be compiled as more referrals are made by those already involved.




**source:** Education Savvy; http://education-savvy.blogspot.com/2015/12/all-types-of-sampling_21.html..

5 **Quota Sampling**—This nonrandom or nonprobability sampling procedure is similar to the stratified random sampling method, except that participants do *not* necessarily have equal chance of being selected. What is important is that the sample has the *same* proportion of students in the population according to certain characteristics.

For example, there are 300 Grade 11 students in a Senior High School composed of 200 girls and 100 boys. If the teacher wants to organize a class of 30 students (n = 30) for an elective course on Leadership and Governance that he or she wants to experiment with and he or she wants the ratio of girls to boys in the sample class to represent that of the entire population, he or she

will have to select 20 girls and 10 boys. The selection may depend on who may possess certain prerequisite traits, who may be recommended by fellow teacher, or who may volunteer to participate. The manner of how this experimental class is assembled does not matter as long as the ratio of girls to boys in the class follows that of the entire Senior High School.

## SUGGESTED SAMPLE SIZES

There are various ideal sample sizes suggested for different types of research designs. These are all intended to enable Action Researchers to apply statistical tools for the purpose of making general statements about an intervention or treatment.

- for experimental and causal-comparative research: *at least* n = 30, preferably *random*, for each group by the time the experiment finishes; therefore, it is good to include more than 30 at the beginning of the study
- for correlational studies: *at least* n = 50, preferably *random*
- for surveys: *at least* n = 100, preferably *random*
- for qualitative studies: sample size can be as small as n = 1 (as in case studies); might have to be purposive, depending on the research question. If more than n = 1, *maximum variation* is recommended (e.g., as *varied* as can be to obtain a full picture of the phenomenon)

*Remember this rule of thumb:* The smaller the population, the larger the sampling ratio should be (e.g., the ratio of the *sample size* to the *population size*).

## ETHICAL CONSIDERATIONS

Below are some ethical considerations in conducting sampling procedures in research.

### 1 Informed Consent

Prior to selecting and including any student as participant in an Action Research or preliminary study, one must first seek *permission* from the adults who have been entrusted with their care and protection. This might mean asking parents or guardians to allow their wards to be part of the study, particularly when an intervention or treatment is to be applied or when sensitive information will be sought from or about them. The permission of the principal or head of the school may also be required. An *informed consent* signed by the parent or guardian may suffice for research purposes. However, this have to be sought way ahead of time before commencing the Action Research or preliminary study.

### 2 Right to Privacy

Each student has a right to privacy. Any information about him or her or any response obtained from or about him or her must be kept confidential. The researcher may have secured their consent and permission prior to collecting data from them, but this does not mean that he or she is at liberty to divulge their identities and whatever data was elicited from them. All information must be kept in utmost confidentiality. Raw data must be kept under lock and key and names of students must be replaced by code names or code numbers. It is the duty of the researcher to ensure that the privacy of each student is honored and maintained.

## PRACTICE/EXERCISE

The following are different Action Research situations. For each one, formulate the appropriate research question and research hypothesis. Then, decide on the research design and justify your choice. Identify also the appropriate sampling method and sample size and explain your reasons. Describe also how you will go about selecting the research participants following your choice of sampling method.

### Situation 1

Teacher A has decided to capitalize on technology by using a free on-line teaching-learning platform for his Grade 10 Physics class. Using the platform will require that students have tablets or mobile phones with stable internet connection. He would like to find out how many students can participate in using this innovation in the class.

### Situation 2

Due to the large enrollment in School X, the 15 sections of Grade 11 ballooned to an average of 60 students per class. In classrooms built to accommodate only 40 students, teachers are forced to allow students to sit on the floor with very little space to move around. Student achievement for the first quarter has been mediocre because students are distracted by the noise level in the classroom. The heat and physical discomfort of sitting on the floor has also contributed to short attention span of students. In order to remedy the congestion, the teacher for Grade 11 Physics has devised a class meeting scheme whereby she meets half of the class Mondays and Wednesdays and the other half Tuesdays and Thursdays. She planned that students will be given assignments and group activities on days that they do not attend classes. She also planned to use Friday class time for brief small group consultations.

### Situation 3

In a seminar that Teacher C recently attended, he relearned about Vygotsky's scaffolding method for helping students achieve expected competencies. He wants to apply this approach to his Grade 6 Algebra class. He plans to find out how helpful this approach will be particularly for those who have poor background in Elementary Mathematics as identified through the diagnostic test he administered during the first week of classes. He plans to observe and interview these students and examine their assignment and seatworks.

Use the following table in presenting your answers.

| Research question and research hypothesis | Research design and justification | Sampling method and reason | Sample size | Brief description of procedure |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |

You may find out if your answers are correct by looking at the suggested answers provided at the end of this guide.

## REFERENCES


Anonymous. n.d. "Choosing a Sampling Method." Changing Minds (website). Accessed May 21, 2018. http://changingminds.org/explanations/research/sampling/choosing_sampling.htm.

Fraenkel, Jack R. and Norman E. Wallen. (1990) 2003. *How to Design and Evaluate Research in Education*. New York: McGraw-Hill.

McLeod, Saul. 2014. "Sampling Methods." Simply Psychology (website). Accessed May 21, 2018. https://www.simplypsychology.org/sampling.html.

## NOTES/SIDEBAR

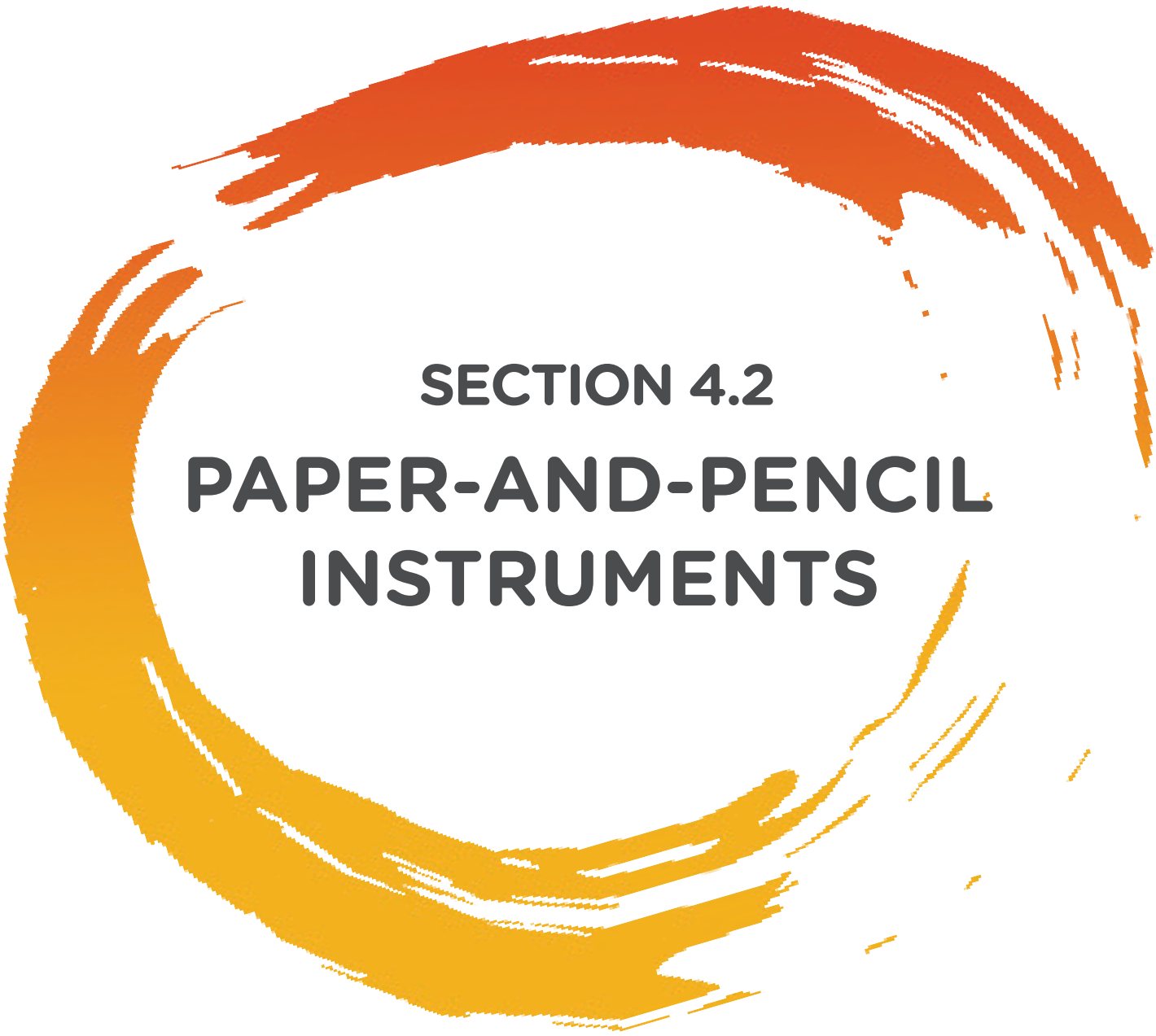
**Tips:**

- **The key to good random sampling is to get a large enough sample size so that respondents from all different demographics and with other defining characteristics are included, thereby minimizing potential sample bias.** It is important to note that this method can be time consuming and expensive, though it is considered a superior methodology. **Purposive sampling ensures that the appropriate number of people from each characteristic is surveyed.**
- **Quotas are set for approximately three or four defining characteristics, sometimes demographic in nature.** Anything more than three or four can make the research process complicated and prone to error; therefore, it is not recommended.

**Source:** https://www.quicktapsurvey.com/blog/3-tips-to-build-a-representative-research-sample/.

# Answer key to practice/exercise

| | Research question and research hypothesis | Research design and justification | Sampling method and reason | Sample size | Brief description of procedure |
|---|---|---|---|---|---|
| 1 | *Question*: How many students in my class have tablets or mobile phones with internet connection?<br><br>*Hypothesis*: About one-half of the students have tablets or mobile phones with internet connection. | Survey Method; The teacher wants to quickly know the characteristics of the class with regard to the requirements for the use of the free online teaching-learning platform | Purposive and Cluster; All students in the entire class (cluster) and the class he is teaching (purposive) | At least 75% or more; if possible, the entire class. | The teacher passes a short questionnaire about tablets, mobile phones, and internet access as well as knowledge in the use of ICT tools. |
| 2 | *Question*: Does the class meeting innovation help increase student attention and, consequently, achievement levels?<br><br>*Hypothesis*: The class meeting scheme does yield better achievement levels for the students in the congested classroom. | Experimental Design; The scheme can be implemented right away in 1 or 2 sections | Random cluster sampling, The scheme can be applied to an entire class | At least 2 sections | The names of the 15 Grade 11 classes are written on small sheets of paper and 2 sections are selected, lottery style |
| 3 | *Question*: In what way/s has scaffolding method applied in Algebra helped low-performing students solve algebraic equations?<br><br>*Hypothesis*: Scaffolding has helped low-performing students understand the processes used in solving algebraic equations. | Qualitative Design; The research question and the corresponding procedures require thick descriptions of experiences, narratives, and analyses of documents. | Purposive sampling; Low-performing students are selected since the intervention is intended for them | 10 low-performing students, at most | The teacher reviews the scores obtained in the diagnostic test and selects the 10 lowest scorers. He then applies scaffolding method in teaching these students either as differentiated instruction or as after class tutorial sessions. |



## SECTION 4.2

# PAPER-AND-PENCIL INSTRUMENTS

# OBJECTIVES

At the end of this section, the reader will be able to:

1. identify various paper-and-pencil instruments that can be used for data collection in Action Research;
2. cite the strengths and weaknesses of using paper-and-pencil instruments;
3. select suitable paper-and-pencil instruments for given Action Research questions;
4. develop skills in preparing items for paper-and-pencil instruments; and
5. point out ethical practices related to the administration of paper-and-pencil instruments.

# INTRODUCTION

Data collection is an important aspect of Action Research. Credibility of findings depends on the accuracy of information gathered for the research. Inaccurate data collection adversely affects the results of a study, which ultimately leads to doubtable, even invalid, conclusions. Your data collection method should then be valid so that you can effectively answer your research question.

This section presents different paper-and-pencil instruments and lists their strengths and weaknesses. It also provides a guide on how to prepare them and offers opportunities to polish skills in deciding suitable instruments for Action Research questions and in writing sample items.

# STEPS/KEY CONCEPTS

## RESEARCH FOCUS AND DATA COLLECTION TOOL KIT

Effective data collection begins with a clearly stated research question. This provides focus for the inquiry and directs the researcher to the suitable data collection procedure. Consider seeking the help of your colleagues in clarifying your research question and in deciding the data collection method that you will use.

Since Action Research is generally classroom-based, it is important for you to explore all the possible sources of data and to maximize these using the appropriate data collection methods, which can be referred to as your data collection tool kit.

Your data collection tool kit may include standardized test, teacher-made test, rating scale, checklist, and questionnaire. Each of these data collection tools can provide the data you need to answer your research question/s.

## FORMS OF PAPER-AND-PENCIL INSTRUMENTS

The following are some of the most frequently used forms of paper-and-pencil instruments.

1 **Standardized tests.** Most standardized tests measure student achievement or aptitude. These go through rigorous development process that include creation of an item pool, pilot testing of items, revisions of poor items based on pilot testing data, and establishment of norms needed for interpreting scores. Moreover, evidences of reliability and validity are provided to ascertain the high psychometric quality of these tests. Such standardized tests are produced by government agencies like the Department of Education (DepEd), as part of its official mandate, or by private institutions, which provide testing services for a fee. These are referred to as such because (1) these require test takers to answer a set of questions from an item bank in the same way and (2) the items are scored in a *standard* or consistent manner, making it viable to compare relative performance of individual students or groups of students. Most standardized tests require a qualified psychometrician or psychologist for administration and scoring. Some examples of local standardized tests are the *Philippine Informal Reading Inventory* (PHIL-IRI), *Early Language and Numeracy Assessment* (ELLNA), and *National Achievement Test* (NAT).

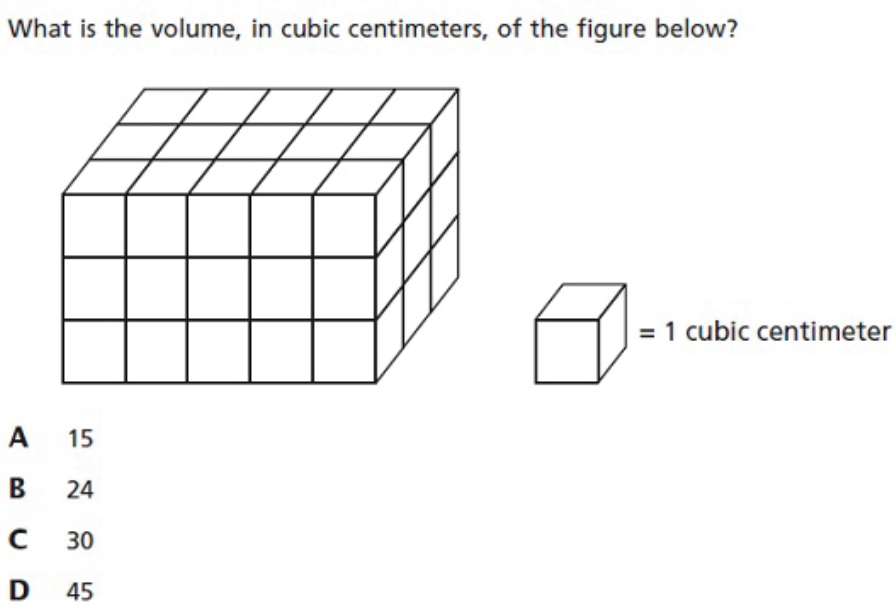



**Figure 4.2.1** Sample item from a standardized test.

**Source:** Leslie Brody; The Wall Street Journal; https://blogs.wsj.com/metropolis/2014/08/06/are-you-smart-enough-for-new-yorks-5thgrade-math-exam-test-yourself/

2 **Teacher-made tests.** Often referred to as *classroom-made tests*, these are tests carefully constructed by teachers to measure students' classroom achievement. For your Action Research, you will most likely be using such tests instead of standardized ones. Teacher-made tests are similar with standardized tests in terms of content, purpose, and format. They differ though in the use of rigid procedures of test development. Teacher-made tests may also not possess the same high psychometric qualities that standardized tests have. For this reason, you, as Action Researcher, may choose to use standardized tests as means for collecting data. However, it is important to recognize that other paper-and-pencil tests such as your diagnostic tests, formative tests, and summative tests can also be sources of reliable and valid data (Johnson 2008).

M15/25 Integer Quiz

Write an integer to represent each situation.

1. a gain of 3 points _____
2. a loss of 7 lbs. _____
3. a $65 withdrawl _____
4. 200 ft. above sea level _____

Evaluate the following for a = 4

5. 5a = _____
6. a + 19 = _____
7. a – 3 = _____
8. a ÷ (-2) = _____
9. 31 - -a = _____
10. (-10)a = _____

Evaluate the following for n = 3

11. 7n + 4 = _____
12. 13n – 16 = _____
13. 7(n+4) = _____
14. 2n + 5 – n = _____
15. 6 ÷ n + 4n ÷ 2 = _____
16. $\frac{6+n}{n}$ = _____
17. $\frac{3n+18}{3n}$ = _____
18. –12 – n = _____

Evaluate the following expressions

19. n + (13 – n) – 5 for n = 8 _____
20. 3x + x ÷ (-3) for x = 12 _____
21. $5x^2$ for x = 3 _____
22. $c^4 - 17$ for c = 1 _____

Evaluate for a = 5 b = 6 c = 1

23. (30 ÷ b) + 9 = _____
24. b + 13 – 2 • a = _____
25. $\frac{20a+2b}{4a-6c}$ = _____
26. $\frac{8}{c} + a \cdot 3$

**Figure 4.2.2.** Page from a teacher-made test.

**Source:** David C. Webb; Educational Designer; http://www.educationaldesigner.org/ed/volume1/issue2/article6/

3 **Rating Scales.** These are instruments that ask respondents to indicate the degree of their agreement or disagreement with presented statements or the frequency of occurrence of certain events through the use of assigned numerical values or given qualitative description to objects. Rating scales are used to measure psychological traits such as behaviors, attitudes, values, and interests.

The most popular form of scale is the *Likert scale*, which requires respondents to indicate the degree of their agreement or disagreement with statements, from *strongly agree* to *strongly disagree*.

Other scales may ask respondents to rate the frequency of occurrence of an event, from *always* to *never*. These are referred to as *Likert*-type scales because of their similarity to the original scale developed by Rensis Likert.

Please rate your experience at the library today:

*Please don't select more than 1 answer(s) per row.*

| | Strongly Agree | Agree | Undecided | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| The library was easy to find. | ☐ | ☐ | ☐ | ☐ | ☐ |
| The receptionists were helpful. | ☐ | ☐ | ☐ | ☐ | ☐ |
| The electronic catalogue was user friendly. | ☐ | ☐ | ☐ | ☐ | ☐ |
| The books I needed were available. | ☐ | ☐ | ☐ | ☐ | ☐ |

**Figure 4.2.2.** Example of Likert Scale.

**Source:** Online Surveys by Jisc; https://www.onlinesurveys.ac.uk/help-support/scalerank-questions/

## Establishing Interval for a Scale

To determine the minimum and the maximum length of the 5-point Likert type scale, the range is calculated by (5-1 = 4) then divided by five as it is the greatest value of the scale (4 ÷ 5 = 0.80). Afterwards, number 1 which is the least value in the scale was added in order to identify the maximum of this cell. The length of the cell is determined below.

- From 1 to 0.80 represents (strongly disagree)
- From 1.81 until 2.60 represents (do not agree)
- From 2.61 until 3.40 represents (true to some extent)
- From 3.41 until 4.20 represents agree

| In the course of last week... | | not at all | a little | rather | much | very strong |
|---|---|---|---|---|---|---|
| 1 | It was hard for me to concentrate | 0 | 1 | 2 | 3 | 4 |
| 2 | I felt helpless | 0 | 1 | 2 | 3 | 4 |
| 3 | I was absent-minded and unable to remember what I was actually doing | 0 | 1 | 2 | 3 | 4 |
| 4 | I felt disgust | 0 | 1 | 2 | 3 | 4 |
| 5 | I thought of hurting myself | 0 | 1 | 2 | 3 | 4 |
| 6 | I didn't trust other people | 0 | 1 | 2 | 3 | 4 |
| 7 | I didn't believe in my right to live | 0 | 1 | 2 | 3 | 4 |
| 8 | I was lonely | 0 | 1 | 2 | 3 | 4 |
| 9 | I experienced stressful inner tension | 0 | 1 | 2 | 3 | 4 |
| 10 | I had images that I was very much afraid of | 0 | 1 | 2 | 3 | 4 |
| 11 | I hated myself | 0 | 1 | 2 | 3 | 4 |
| 12 | I wanted to punish myself | 0 | 1 | 2 | 3 | 4 |

**Figure 4.2.3** Sample Likert-type items.

**Source:** Template Lab; http://templatelab.com/likert-scale/.

Some rating scales make use of graphics. Respondents are asked to answer using the images representative of their opinion.

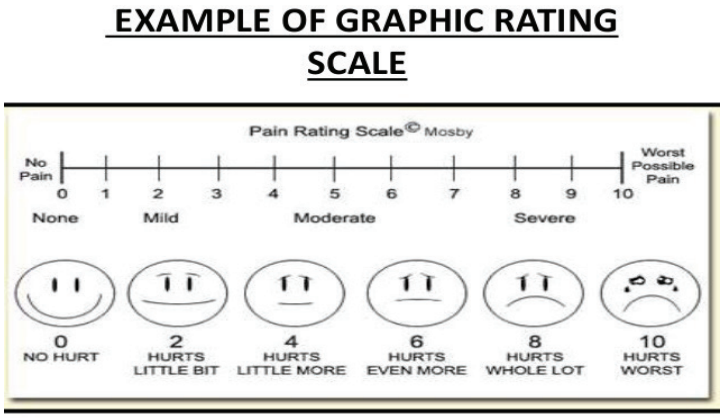



**Figure 4.2.4.** Sample graphic rating scale.

**Source:** Sayawad Institute of Higher Education; https://www.slideshare.net/FIROZQURESHIrating-scale-58685558

Other rating scales make use of descriptions. Adjective rating scales provide depictions of the object to be rated together with specific descriptive scales.

| Performance Factor | Performance Rating | | | | |
|---|---|---|---|---|---|
| *Quality of work* is the accuracy, skill, and completeness of work. | 1 Consistently unsatisfactory | 2 Occasionally unsatisfactory | 3 Consistently satisfactory | 4 Sometimes superior | 5 Consistently superior |
| *Quantity of work* is the volume of work done in a normal workday. | 1 Consistently unsatisfactory | 2 Occasionally unsatisfactory | 3 Consistently satisfactory | 4 Sometimes superior | 5 Consistently superior |
| *Job knowledge* is information pertinent to the job that an individual should have for satisfactory job performance. | 1 Poorly informed about work duties | 2 Occasionally unsatisfactory | 3 Can answer most questions about the job | 4 Understands all phases of the job | 5 Has complete mastery of all phases of the job |
| *Dependability* is following directions and company policies without supervision. | 1 Requires constant supervision | 2 Requires occasional follow-up | 3 Usually can be counted on | 4 Requires very little supervision | 5 Requires absolute minimum of supervision |

**EXHIBIT 12-3**
**Example of adjective rating scale items.**

**Figure 4.2.5.** Example of adjective rating scale items.

**Source:** Mary Bell; Slideshare; http://slideplayer.com/slide/4779961

The following are some rating scale values that you may use for your Action Research.

| Very interested | Somewhat interested | Neutral | Not very interested | Not at all interested |
|---|---|---|---|---|
| Very much | Somewhat | Undecided | Not really | Not at all |
| Very much like me | Somewhat like me | Neutral | Not much like me | Not at all like me |
| Very happy | Somewhat happy | Neutral | Not very happy | Not at all happy |
| Almost always | Sometimes | Every once in a while | Rarely | Never |

4 **Checklists.** Sometimes, in your preliminary research, you just want to know if certain things are present or not in the population or sample. In this case, a checklist is a more appropriate paper-and-pencil instrument to use. Respondents simply have to mark those things that are present and leave blank those that are not.

## Checklist for evaluation of texts

| Name of Text_____Author_____ Student Group Designed for_____ | YES | NO | Not applicable |
|---|---|---|---|
| 1. Authors include<br>a. Experts in Second Language Research?<br>b. Classroom Teachers?<br>c. Writers for Children? Adults? | | | |
| 2. Philosophy<br>a. Agrees to "no one best way" in teaching<br>b. Believes in one specific methodology<br>c. Believes in an eclectic approach<br>d. Promotes positive attitudes | | | |
| 3. Appropriate for Audience: text appears to be intended for<br>a. Age of learners_____<br>b. level of proficiency _____<br>c. Purpose for studying English | | | |

**Figure 4.2.6.** Sample checklist.

**Source:** https://www.google.com/search?biw=1024&bih=606&tbm=isch&sa=1&ei=02MvW9vBB9aR9QOd-kK74CQ&q=classroom+activities+checklist+example&oq=classroom+activities+checklist+example&gs_=img.3...408920.415292.0.418848.20.17.0.0.0.0.307.2285.0j5j4j1.10.0....0...1c.1.64.img..13.3.783...0i8i30k1.0.7RxHnAQsn6U#imgrc=tu6gDGFzuB-TOhM:

5 *Questionnaires.* These are instruments that consist of questions that research participants have to answer. These can either be closed ended or open ended. Closed-ended questions provide options from which respondents have to select their answers. These make data analysis easier. However, responses are limited only to those already provided. Open-ended questions ask respondents to construct their own responses. These allow them to give their own personalized answers. However, this makes data analysis a bit more tedious.

## Sample questionnaire for childcare services

***Thank you for taking the time to consider our questionnaire. If at anytime you do not wish to answer a question please leave blank and move on to the next question. Your opinion is very important to us.***

1. Would you be interested in using an after school club, breakfast club, holiday club or day nursery?

☐ Immediately ☐ In 3-6 months ☐ In 6-12 months ☐ Not at all

2. How many children would you need places for? ☐

3. On which days would you prefer the club/provision to run ?

☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday

4. Which opening times would you most prefer? e.g. 8am-6pm/9am-3pm

Your preferred opening times;

Additional day care for Pre school children, please state what your requirements would be.

**Breakfast club**
7.45am - 8.45pm ☐ 7.30am – 8.50am ☐ 8.00am – 8.50am ☐

**After school club**
3.00pm - 5.00pm ☐ 3.00pm – 5.30pm ☐ 3.00pm – 6.00pm ☐

**Holiday club**
8.00am - 5.00pm ☐ 8.30am – 5.30 pm ☐ 9.00am – 6.00 pm ☐

Others (please specify) ☐

5. How much would you be prepared to pay for this service?

Child per hour/session ☐

6. What activities would you want to see on offer?

**Figure 4.2.7.** Sample questionnaire.

**Source:** https://www.google.com/search?biw=1024&bih=606&tbm=isch&sa=1&ei=d2UvW-y-M8nd9QOn-rLfACg&q=questionnaire+examples+for+research&oq=questionnaire+example&gs_l=img.1.1.0i67k1j0j0i67k1j0l7.1116727.1123615.0.1126078.33.19.1.2.2.0.777.4144.2-4j5j0j1j1.11.0....0...1c.1.64.img..21.12.3573...0i10i24k1j35i39k1.0.I7-w6a_sg4k#imgrc=MghtMry0818R0M

## ADVANTAGES AND DISADVANTAGES OF PAPER-AND-PENCIL INSTRUMENTS

It is important that you also understand the strengths and weaknesses of paper-and-pencil instruments. These will give you an idea on whether these instruments are suitable for your Action Research and an understanding of how to minimize their weak points so as not to adversely affect the findings of your study.

**Table 4.2.1.** Advantages and disadvantages of paper-and-pencil instruments

| ADVANTAGES | DISADVANTAGES |
|---|---|
| • can be administered to large groups of students<br>• suitable for measuring intelligence, scholastic aptitude, intellectual ability, attitude, reflections, and thinking processes<br>• can assess individual students<br>• easy data encoding and analysis | • can measure only knowledge, mental abilities, behavior, and other psychological traits<br>• subject to faking; respondents may not be honest about their responses<br>• objective tests are susceptible to guessing<br>• preparing good items or statements is difficult<br>• needs careful development to ensure reliability and validity<br>• not suitable for measuring skills |

## PREPARING PAPER-AND-PENCIL INSTRUMENTS

The following key points provide you with some of the basic steps and considerations in preparing your paper-and-pencil instruments.

1. Identify the objective/s of the test, rating scale, checklist, or questionnaire.
2. Describe the ability, content knowledge, skill, or attribute that will be measured. If you are collecting data about mental abilities, content knowledge, or skills, consider the competencies expected for these. If you are planning to measure affective traits such as attitudes, interests, or perceptions, conduct first a literature review of these traits to specify the components that should be included in your instrument.
3. Prepare a table of specifications for the test or rating scale or an outline of the content of the questionnaire. As you know, the table of specifications is a two-way grid that specifies the content of the test or dimensions of the trait to be measured, with the proposed number of items for each content or dimension.

| | Cognitive Level | | | |
|---|---|---|---|---|
| Subject | Knowledge & Comprehension | Application | Analysis & Evaluation | Total |
| Topic 1 | 10% | 20% | 10% | 40% |
| Topic 2 | 15% | 15% | 30% | 60% |
| TOTAL | 25% | 35% | 40% | 100% |

**Figure 4.2.9.** Sample table of specifications for a test

**Source:** UPOU e-journal: https://myeds103rochelle.wordpress.com/2016/03/13/module-4-assessment-planning-construction-reporting-feedback/

**Table of Specifications in _____**

| Content | No. of Hours | Weight Percentage | Cognitive Level | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | | Remembering 35% | Understanding 35% | Applying 10% | Analyzing 10% | Evaluating 5% | Creating 5% | |
| Topic 1 | | | | | | | | | |
| Topic 2 | | | | | | | | | |
| **TOTAL** | | | | | | | | | |

**Figure 4.2.10.** Sample table of specifications for a test

The following is an example of table of specifications for a paper-and-pencil instrument measuring affective trait.

| | Components of self-esteem* | No. of Items | % of Items |
|---|---|---|---|
| 1 | Significance—feeling of being loved | 5 | 25% |
| 2 | Competence—ability compared with other | 5 | 25% |
| 3 | Power—control over who one is | 5 | 25% |
| 4 | Virtue—feeling of being a good person | 5 | 25% |

***Source of components:** Micky Lyf; SlideShare : https://www.slideshare.net/mickylyf/self-esteem-and-effectiveness

4 Write potential test items or item pool. Prepare more items than needed to allow you to select the better ones. Follow the specific guidelines in preparing teacher-made tests. In preparing rating scales, be sure to have about equal number of positively stated item ("I love going to school") and negatively stated items ("I would rather stay home than go to school") so that research

participants will not have "response sets" or the tendency to answer all items in similar way. In writing questionnaires, logical sequencing of items must be observed. Statements should also be short and straightforward.

5. Select items for the draft of the instrument from the item pool.
6. Compose the answer key or scoring plan for the items selected. In most tests, a score of "1" is given for each correct answer and "0" for incorrect answer. In rating scales, positively stated items are given the highest values for positive response; the scoring is reversed for negatively stated items.
7. Present the draft of instrument to a subject matter expert and, whenever possible, to a test or measurement expert for validation.
8. Make the necessary revisions on the items as suggested by expert/s.
9. Produce the master copy of the test, rating scale, or questionnaire for final inspection.
10. Review the master copy to ensure that the format, pagination, and overall look make it readable and attractive to respondents
11. Create the final answer key or scoring system based on the master copy and keep it in a secure place.
12. Make enough copies of the instrument for administration. It is important to count the number of copies made and to make sure that extra copies are with you. No extra copies should be left in the hands of the respondents to ensure the instrument's security. Keep the used and unused copies in separate envelopes, properly labelled, and store them in a secure place.

## SAMPLE ACTION RESEARCHES AND DATA COLLECTION INSTRUMENTS USED

The following table contains sample Action Research titles and instruments used to gather qualitative data (*copies appended at the end of this section*). These quantitative data are usually validated using other data sources. Read the complete articles to better understand how the instruments were constructed to be able to obtain data for the research questions.

| Title of research | Research question/s | Quantitative data collection instrument/s used |
|---|---|---|
| Increasing Student Learning in Mathematics with the use of Collaborative Teaching Strategies | How do collaborative teaching strategies help in increasing student learning in Mathematics? | teacher-made test; questionnaire |

| | | |
|---|---|---|
| Using the *e-Math* Intervention Program in Improving Student Engagement and Achievement in Mathematics | Does *e-Math* intervention program help in improving student engagement and achievement in Mathematics? | teacher-made test; student engagement in Mathematics rating scale |
| Effects of the Flipped Classroom Model on Student Level of Mathematical Discourse and Achievement | What is the effect of the flipped classroom model on student level of mathematical discourse and achievement? | teacher-made test; classroom observation checklist |

## ETHICAL CONSIDERATIONS

### 1 Permissions

Before administering a paper-and-pencil instrument to your target research participants, it is important to notify first and get permission from your principal and schools division superintendent. Usually, you will be required to submit a copy of your research proposal along with the data collection instrument. Parental consent may also be needed, since most of the time, our very own students are our research participants.

### 2 Anonymity and Confidentiality

In administering a paper-and-pencil instrument, it is important to keep the respondents anonymous and their responses confidential even if the research topic is not a sensitive one and the information collected may not be personal or private. Most respondents are willing to give honest responses if information are obtained anonymously. It is difficult to ensure anonymity in view of the fact that some demographic data points might easily give away identifies of respondents. However, we, as researchers, are responsible to do our best to ensure anonymity of our respondents.

Most paper-and-pencil instruments begin with a statement that the information collected from participants will be "treated with utmost confidentiality." With this preliminary assurance, respondents become more willing to provide data that will enable us to derive reliable and valid results that will, in turn, lead to useful conclusions and recommendations.

## PRACTICE/EXERCISE

**A** The following table contains different topics for Action Research. For each topic, formulate a proper research question and identify appropriate data collection instruments that may be used. Provide at least one to two examples of items based on the chosen data collection instrument. Use the following table in presenting your answers.

| Action Research topic | Research question | Paper-and-pencil instrument | Sample items |
|---|---|---|---|
| Use of collaborative teaching strategies to increase achievement | | | |
| Provide group guidance to reduce bullying and student discipline problems | | | |
| Effects of flipped classroom style on student discourse and achievement in physics | | | |

**B** Create three paper-and-pencil instruments (a *rating scale*, a *checklist*, and a *questionnaire*; preparing tests not included in this exercise since it is already familiar) considering the topic you have in mind for your Action Research. Then, identify the variables that can be measured by each of these instruments.

For rating scale, you may use the *Student Evaluation of Teachers and Teaching Techniques (SE3T)* made by Craig Mertler (2014) as example. This instrument provides teachers with feedback on their classroom teaching.

Be sure to prepare a simple table of specifications or plan for each of the three instruments. Then, write at least five (5) items for each instrument. Bring the table of specifications or plan and the instruments you have created in the next learning session.

## REFERENCES


Di Fatta, Jenna, Sarah Garcia, and Stephanie Gorman. 2009. "Increasing Student Learning in Mathematics with the Use of Collaborative Teaching Strategies" (Action Research Proposal). Education Resources Information Center (website). Accessed May 14, 2018. https://files.eric.ed.gov/fulltext/ED504828.pdf.

Johnson, Andrew P. (2001) 2008. *A Short Guide to Action Research*. Boston: Allyn & Bacon.

Mertler, Craig A. (2011) 2014. *Action Research: Improving Schools and Empowering Educators*. Thousand Oaks, California: SAGE Publications.

Mills, Geoffrey E. (1999) 2003. *Action Research: A Guide for the Teacher Researcher*. New Jersey: Pearson.

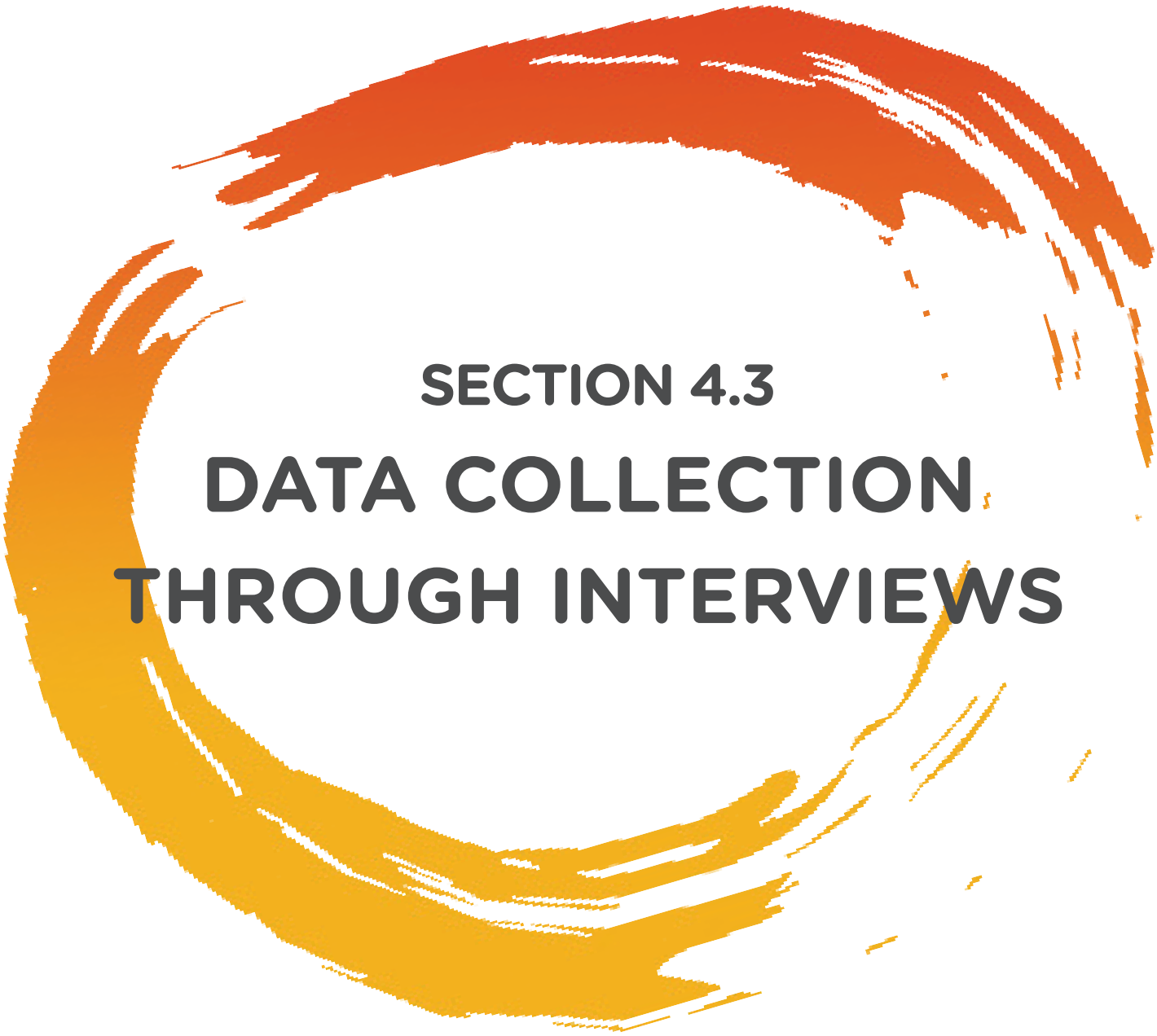
Sagor, Richard. 2000. *Guiding School Improvement with Action Research*. Alexandria, VA: ASCD.

Great Schools Partnership. 2015. "Standardized tests." The Glossary of Education Reform (website). Accessed May 14, 2018. https://www.edglossary.org/standardized-test/.

Rensis Likert. Retrieved from https://www.google.com/search?q=who+developed+-likert+scale&source=lnms&sa=X&ved=0ahUKEwiWtoza6uvbAhUXeysKHemgADQQ_AUICSgA.


## NOTES/SIDEBAR

**Tip:** For more ideas on standardized tests, you may want to check some of those that are possibly in the custody of your guidance counselors or subject area supervisors. A number of standardized tests available online can also be adapted or used as reference for your Action Research.



SECTION 4.3

# DATA COLLECTION THROUGH INTERVIEWS

# OBJECTIVES

At the end of this section, the reader will be able to:

1. explain the interview method of data collection in Action Research;
2. enumerate the different types of interviews; and
3. observe important guidelines in conducting Interviews as data collection method for Action Research.

# INTRODUCTION

Aside from paper-and-pencil instruments, another effective method of gathering qualitative data for Action Research is interviewing wherein questions are asked to each respondent on a face-to-face manner.

Data collected through interview has the unique advantage of having the Action Researcher observe the facial expressions and other nonverbal gestures of the respondents.

# STEPS/KEY CONCEPTS

## INTERVIEW AS DATA COLLECTION METHOD

- method of collecting data from respondents by directly asking them questions
- useful for obtaining the "story" behind an interviewee's experiences
- can derive in-depth information around the topic of research
- excellent way of collecting rich qualitative information from a limited number of people
- helpful in following up certain participants and further investigating their responses to tests, rating scales, questionnaires, and similar instruments
- suitable for Action Research questions or preliminary research questions that require verbal form of data, such as those obtained during a conversation between the researcher and the respondents
- focuses on the *depth* of exploration of a topic, not necessarily in the breadth of views, which can be obtained through paper-and-pencil instruments like a questionnaire
- requires clear research question to guide the preparation of interview questions and its conduct
- suitable for gathering data to be used in answering Action Research questions such as the following:

a What are the effects of the innovation on students?
b How did the students respond to the treatment implemented in the classroom?

- useful also in gathering authentic information for preliminary research questions such as the following:
  a What are the reasons why students do not submit assignments?
  b What class activities do student enjoy and not?

## TYPES OF INTERVIEWS

Interviews can be classified according to (1) structure, (2) number of interviewees, and (3) mode of conduct. Each classification has various forms.

### 1 Interviews according to structure

a **Structured interview**—Set of questions are asked in sequence. Respondents answer the same set of questions. No probe or follow-up questions are asked. Comparison and summarizing of responses across interviewees are easy to do in this type of interview.

b **Semi-structured interview**—Broad range of questions are asked in varying order determined by responses to previous questions. Key points of discussion are also used as starting points for interview. This type of interview allows freedom and flexibility in getting information from the interviewee using probe or follow-up questions to supplement broad questions. This is also known as *general interview guide approach* because the same general areas of information are collected from each interviewee.

c **Unstructured interview**—One question is asked to begin the interview. Succeeding questions are composed based on the response to the previous questions. This is also referred to as *informal* or *conversational* interview. This provides open and adaptable atmosphere that takes into consideration the interviewee's nature and priorities. The interviewer seems to just "go with the flow" of the conversation.

### 2 Interviews according to number of interviewees

a **Individual interview**—One respondent is interviewed at a time.
b **Focus Group Discussion (FGD)**—Several respondents are interviewed at the same time as a *focus group*.

3. **Interviews according to mode of conduct**

   a **Face-to-face interview**—Interviewer meets with interviewee in person to do the interview.
   b **Distant interview**—This refers to technology-mediated interviews, such as telephone interviews or interviews conducted online (via the internet or through Skype). This is done when meeting face-to-face with respondents is not possible.

## TYPES OF PROBE

a The **basic probe** is repeating the initial question, which reminds the interviewee what you asked. This is useful if they have wandered off the subject.
b **Explanatory probes** are questions like 'What did you mean by that?' and 'What makes you say that?' and are useful for exploring meaning further.
c **Focused probes** include questions like 'What sort of…?'
d The **silent probe** is where the interviewer simply remains silent and waits for the interviewee to say more.
e **Drawing out** is useful when the interviewee seems to have stopped mid-sentence or mid-idea. Repeat the last few words that they said with an upward inflexion, like a question, or add 'Tell me more about that'.
f **Giving ideas or suggestions** would use questions like 'Have you thought about x?' or 'Have you tried…?'

Source:https://www.skillsyouneed.com/learn/interviews-for-research.html.

## PREPARING INTERVIEW QUESTIONS

There are two types of interview questions that you could come up with.

1 **Open-ended question**
This refers to questions that start with "what," "how," and "why." Such questions give interviewees the freedom to use their own words in their responses. This type of questions is preferred for interviews.
2 **Closed-ended question**
This refers to questions that provide interviewees with options to choose their answers from. Examples of these are those that are answerable by "yes" or "no." Such questions are recommended only as preliminary questions before open-ended ones are asked.

Interview questions can delve on any of the following topics, which could be stated in terms of past, present, or future forms.

1. **Background/Demographics**—personal information about the interviewee, such as age, grade level, sibling rank, and place of residence
2. **Behaviors**—what a person has done, is doing, or will do
3. **Opinions/Values**—what a person thinks about a topic
4. **Feelings**—sentiments or emotional states (*Note*: When interviewees respond with "I think ...," be sure to clarify that you are asking about feelings and not opinions.)
5. **Knowledge**—facts about a topic
6. **Sensory**—what respondents have seen, touched, heard, tasted, or smelled

## WORDING OF INTERVIEW QUESTIONS

- Questions must be *open ended*. Respondents should be able to use their own words or terms when answering questions.
- Questions must be, as much as possible, *neutral*. Avoid suggestive, judgmental wording that might sway answers such as "*Do you not agree that it was somewhat difficult...*"
- Questions must be asked *one at a time*. Do not ask multiple questions at the same time.
- Questions must be worded *clearly*. Whenever possible, use terms from the respondent's culture.
- Ask "why" questions with great care because these presuppose a cause-effect relationship that may not really exist. These also make interviewees feel defensive prompting them to justify their response, which may hinder their willingness to further participate in the interview.

## DELIVERING AND SEQUENCING INTERVIEW QUESTIONS

- Get the respondents involved in the interview *as soon as possible*. Avoid lengthy introductions and presentation of preliminary or background information.
- Ask about *facts* first before proceeding to sensitive topics, such as feelings and conclusions. Respondents engage better in the interview after some kind of "warming up" is observed before more personal matters are discussed.
- Spread *fact-based questions* throughout the interview to prevent boredom on the

part of the interviewee. A series of fact-based questions may lead respondents to be disengaged in the interview.

- Ask questions about the *present* before questions about the past or the future. Respondents find it easier to talk about the present; from there, they move on to talk about the past or the future.
- End the interview by asking questions that would allow respondents to provide other information that they prefer to add and to share their impressions of the interview.

## CONDUCTING THE INTERVIEW

The following are guidelines to observe *before, during*, and *after* the conduct of an interview for data collection purposes.

### A Before the interview

1. If possible, provide the respondents with copies of the *interview questions*.
2. Choose a *venue for the interview* that has as little distraction as possible. Avoid places with bright lights or loud noises. Ensure that the interviewee is comfortable (you may ask them if they are). If they are students, you may wish to conduct the interview in a vacant classroom or in a quiet corner in the library. Some respondents may also feel more comfortable being interviewed in their own homes.
3. Explain the *purpose* of the interview.
4. Assure the interviewee of *confidentiality* and *anonymity*. You may also wish to explain how their responses will be analyzed. Ask permission to quote their comments anonymously if you have to. If you wish, you may want to obtain a signed "Informed Consent" from each interviewee.
5. Briefly discuss the *format* of the interview (e.g., if it is a structured, semi-structured, or unstructured one). Explain the type of interview you are conducting and its nature. Specify also if you will allow them to ask questions they might have or if you prefer to finish your interview first and wait until the end to answer their questions. Avoid the situation where the respondent becomes the interviewer and you become the interviewee. Quickly return to your purpose for the interview when this happens.
6. Indicate *how long* the interview will take. For most interviews, one hour is usually sufficient to ask the questions and secure the responses.
7. Tell them *how* to get in touch with you later if they want to. Give them your contact number in school.

8 Ask them if they have any questions before you get started with the interview proper.
9 Do not rely on your memory to recall their answers. Ask for permission to record the interview in writing and/or in a tape or video recorder. You may also bring along someone to take notes for you, but be sure to inform the respondent about this.

## B During the Interview

1 Write notes even if you are already recoding the interview.
2 If you are using a tape recorder, check it occasionally to make sure that it is still working.
3 Ask one question at a time. Pause after asking a question.
4 Keep a neutral stance as much as possible. Avoid showing strong emotional reactions to the responses. One suggestion is to act as if "you've heard it all before."
5 Reinforce or support responses with occasional nods of the head and expressions of assurance such as "uh huh."
6 Be "cool" when you take notes. Try not to be so eager in jotting down responses, as it might indicate surprise or delight on your part and may affect responses to future questions.
7 Provide transition between major topics. For example, you may say, "We've been talking about (some topic) and now I'd like to move on to (another topic)."
8 Take control of the interview. Keep respondents focused on the topic and bring them back to it if they stray. Repeat a question if it takes the interviewee a long time to answer. You may rephrase it if you still do not get a response. You may also suggest moving on to another topic and returning to the unanswered question later. Study if the delay in or lack of response is due to memory loss or unwillingness to divulge the information. Sometimes, rephrasing the question and asking it at a later time, more opportune time, works. Manage the time by ensuring that the interview ends at exactly the time you said it will.
9 At the end of the interview, summarize the responses given and ask the interviewee if he or she wished to clarify, add, or remove any response given. Give the respondent the freedom to "edit" his or her responses. Some interviewees tend to volunteer information right away only to realize later that they should not have done so. Respect their decisions or requests to remove any response that they do not wish to be recorded and used as data.

10 Secure the contact number of the interviewee should you need to clarify some responses later.
11 Express your gratitude and bid goodbye as promptly as you can.
12 If possible, give a little token of appreciation for the time spent with you. Students are often delighted with light snacks after the interview.

### C Immediately after the interview

1 If you used a tape recorder, verify if it worked throughout the interview.
2 Document the source of the information by writing the name (or initials) of the interviewee and the time, date, and place of the interview.
3 Review your notes and rewrite any scribblings that are not legible. Make clarificatory notes on *your* written notes. Fill in any notes that are missing or notes that do not make sense. Ensure that the pages of your notes are numbered.
4 At the end of your interview notes, write any observations you have made during the interview. For example, you may indicate if the respondents were particularly nervous, if there were any surprises, or if there were any unfortunate events (e.g., malfunction of the recording device) during the interview.

## TIPS FOR FACILITATING FOCUS GROUPS

Your role as a facilitator is very important. Your ability to make everyone comfortable, encourage everyone to speak up, enforce a respectful tone, and manage the pace will determine the quality of the discussion and therefore, the information you gather. It is a good idea to enlist the help of a note taker and a recorder. This will aloow you to focus your attention on the discussion while also ensuring accurate notes. The tips below can help you make focus groups as effective as possible.

### Preparing the Room

- Arrive an hour early with your assistant to set up the room. This allows time to deal with unexpected room scheduling, and to set up materials and refreshments.
- Post plenty of signs so participants can find their way to the space. This helps participant feel welcome when they arrive.
- Test your recording equipment to be sure it works.

### Opening the Session

- Introduce yourself, your assistant, and the purpose of the focus group. Explain to the participants that they have been invited to share their opinions and that you will guide the discussion by asking the group to reflect on specific questions. Tell them what time the session will conclude.
- If the focus group is a part of a research study. Provide a written informed consent from that explains what the participants are being asked to do, what their rights are, and how privacy and confidentiality will be secured. Be sure to provide a contact information so that researchers can be reached it the future to answer questions.
- Explain the ground rules for the focus group discussion. These will set the tone and expectations for behavior so that everyone will feel safe and willing to participate.

**Note:**

- Participation in the focus group is voluntary.
- It's all right to abstain from discussing specific topics if you are not comfortable.
- All response are valid – there are no wrong or right answers.
- Please respect the opinions of others even if you don't agree.
- Try to stay on topic; we may need to interrupt so that we can cover all the material.
- Speak as openly as you feel comfortable.
- Avoid revealing very detailed information about personal health.
- Help protect other's privacy by not discussing details outside the group.
- Allow time for questions, and then ask participants to introduce themselves.

## FACILITATING THE FGD

### DO

- Open the session with a fun, non-threatening, open-ended question; this will enable everyone to develop a comfort level with speaking in front of the group and sharing their ideas.
- Pay attention to non-verbal signals – someone might be sending a cue that he/she is uncomfortable or might have something to say.
- Ask open-ended questions one at a time. Probe when a response is unclear.

Ask ,"Can you say more about.." The latter may make participants feel they need to defend their point of view.

- Balance participation by asking, "Who else has something to say? Or "I would like to hear more from.."
- Redirect the discussion when it strays too far off topic.
- Record the participant's axctual words as much as possible. Avoid temtation to paraphrase. This will show each participant that his/her ideas are unique and important.
- Check with participants that you understand what they are saying.

### DON'T

- Read the script questions verbatim.
- Finish people's sentences or make assumptions about what is being said by someone.
- Allow one or two people to dominate or to use the focus group for their own agenda.
- Permit side discussion
- Take sides or challenge what is being said.
- Share your own opinions.
- Favor one participant over the others.
- Use jargon or technical terms.

## CLOSING THE SESSION

- End the discussion by summarizing the main points. If ther is time, invite the participants to reflect on the main ideas, and ask if they have any additional thoughts to share.
- Thank the group for participating; let them know how the discussion results will be used.
- Collect and save all notes and recordings.
- If a report will be produced, let them know when it might be available and how they can obtain a copy.

## ANALYZING AND USING THE RESULTS

- Review the answers to the main questions asked during the focus group and look for common ideas or themes. Note which ideas seem to be most important to the group.
- Make sure to remove information that could identify the participants or their work

units. Maintaining confidentiality in reporting is important for respecting and protecting participants.

- Use caution when using the information gathered to make decisions about programs or policies. The perspectives shared are valid only for the participants and may not reflect the perspectives of other people. Conducting multiple focus groups may be effective for gathering feedback that is more representative of the organization's total workforce.

Source: CPH-NEW (n.d.).CPH-NEW Tips for Facilitating Focus Groups

## ETHICAL CONSIDERATIONS

- Any interview should proceed only after *permission* has been obtained from parents, administrators, and others concerned.
- All those who will be affected by or are involved in the interview have the *right to be informed, consulted, and advised* about the purpose of the Action Research.
- The researcher is responsible for the *confidentiality* of the data gathered through the interview.
- The respondents have the *right to refuse* the interview. In this case, another respondent should have to be recruited as replacement.

# REFERENCES


Allmark, Peter, Jonathan Boote, Eleni Chambers, Amanda Clarke, Ann McDonnell, Andrew Thompson, and Angela Mary Tod. 2009. "Ethical Issues in the Use of In-Depth Interviews: Literature Review and Discussion." *Research Ethics Review* 5, no. 2: 48. https://doi.org/10.1177/174701610900500203.

Dana, Nancy Fitchman. 2013. *Digging Deeper into Action Research: A Teacher Inquirer's Field Guide.* Thousand Oaks, CA: Corwin.

Department of Education. 2017. Supplemental Research Guides and Tools. DM 144, s. 2017.

Department of Education. 2017. Research Management Guidelines. DepEd Order No. 16, s. 2017.

Fraenkel, Jack R. and Norman E. Wallen. (1990) 2003. *How to Design and Evaluate Research in Education.* New York: McGraw Hill.

Hendricks, Cher. (2012) 2013. *Improving Schools through Action Research: A Reflective Practice Approach*. Boston, MA: Pearson.

Mc Kernan, James. (1991) 1996. *Curriculum Action Research: A Handbook of Methods and Resources for the Reflective Practitioner*. London: Kogan Page.

Mertler, Craig A. (2011) 2014. *Action Research: Improving Schools and Empowering Educators.* USA: SAGE Publications, Inc.

Mills, George E. (1999) 2017. *Action Research: A Guide for the Teacher Researcher.* United Kingdom: Pearson Education Limited.

## NOTES/SIDEBAR

**Tips:** In conducting an interview, observe the following:

1. Listen more and talk less.
2. Follow up on what the interviewee says.
3. Avoid asking leading questions.
4. Keep the interviewees focused and ask for specific details.
5. Do not reinforce interviewee's responses.

Interviewers may, however, need to probe deeper into a subject. For this, specific questioning techniques can be useful.

### TYPES OF PROBE

- The *basic probe* is the repetition of the initial question, which reminds the interviewee what you asked. This is useful if they have wandered off the subject.
- *Explanatory probes* are questions like 'What did you mean by that?' and 'What makes you say that?', which are useful for exploring further meaning.
- *Focused probes* include questions like 'What sort of...?'
- The *silent probe* is when the interviewer simply remains silent and waits for the interviewee to say more.
- *Drawing out* is useful when the interviewee seems to have stopped mid-sentence or mid-idea. Repeat the last few words that they said with an upward inflexion, like a question, or add 'Tell me more about that.'
- When *giving ideas* or *suggestions*, you may use questions like 'Have you thought about x?' or 'Have you tried...?'

Read more on probing at: https://www.skillsyouneed.com/learn/interviews-for-research.html.

SECTION 4.4

# DATA COLLECTION THROUGH OBSERVATIONS

# OBJECTIVES

At the end of this section, the reader will be able to:

1. define observation as a method of collecting data for Action Research;
2. name the different types of observations;
3. identify the devices used in recording data from observations; and
4. apply the observation method in making preliminary assessment of a situation (stage 1 of the Action Research framework).

# INTRODUCTION

Data are gathered for different purposes in Action Research. Your Action Research question guides you in choosing the data collection tools to be used, deciding the information to be collected, and determining the kinds of strategies that will be most effective in providing this information.

There are different methods of gathering data; each has a purpose as well as advantages and challenges. Your objective should be to be able to collect trustworthy, authentic, and credible data considering ethical standards.

This section will focus on observation as data collection method for Action Research. Tools or instruments used in recording observations will also be introduced.

# STEPS/KEY CONCEPTS

## OBSERVATION AS DATA COLLECTION METHOD

- *Observation* is a methodical procedure of collecting data for Action Research or for preliminary study prior to Action Research.
- Observation requires the researcher to use all of his or her senses to learn about people in natural settings or naturally occurring situations.
- It is a relatively economical procedure to conduct; you only need paper and pen and good pairs of eyes and ears.
- It can be time consuming and may require physical and mental stamina on your part as the observer.
- When used in the field setting, it involves the following conditions:
  - **a** prolonged engagement in the setting or situation
  - **b** clearly expressed, self-conscious notations when observing
  - **c** methodical and planned creativeness in order to accomplish the task
  - **d** standardized recording of one's observations

## METHODS OF OBSERVATION

Observation can be done through the following two methods.

1. **Overt observation**—*Participants are aware of being observed. Your identity and purpose as researcher are known to them. Permission to do the observation have to be sought; therefore you are acknowledged as an observer.*
2. **Covert observation**—*Participants are not informed about and are not aware of being observed. Observation is conducted "under cover." Your identity and purpose as researcher are not revealed to the participants. You are free to pretend to be a legitimate member of the group being observed.*

## TYPES OF OBSERVATIONS

Aside from having different methods of conduct, observation as data collection method also has various types.

1. **Controlled observation**
   - This is usually conducted in a laboratory setting.
   - The researcher determines the place and time of the observations, the participants who will be observed, and the circumstances under which the observation will be done using a standardized procedure.
   - Participants can be randomly "assigned" or exposed to situations of interest.
   - The actual observation is usually *overt*.
   - The researcher is a *non-participant*, keeping a distance and avoiding direct contact with the actual participants (e.g., observing behind a two-way mirror).
   - Predetermined structured observation instrument with codes for behavior to be observed is used to standardize the procedure and recording. Letters or numbers are designated to describe a characteristic.
   - Data collected can be easily tallied and analyzed using statistics.
   - Checklists and rating scales may also be employed to indicate presence or intensity of behavior.
   - *Among the strengths of controlled observation* are: easy replication by other researchers; possibility of determining inter-observer (between observers) or intra-observer (within an observer) reliability due to standardized tools; simple and speedy coding and analysis of data; capability for large sample size representative of the population due to relatively short observation time; and possibility of making generalization from sample to population
   - *One limitation of controlled observation* is *Hawthorne effect* or demand characteristics. Participants behave differently when they know that they are being observed. The data obtained may then lack validity.

## 2 Naturalistic observation

- Also called *unstructured observation*, this type of observation involves the study of the *spontaneous* behavior of participants in their natural surroundings.
- The researcher records details pertinent to the objectives of the observation or the research question.
- The researcher conducts observations of participants where they are naturally found. (e.g., classrooms, playground, cafeteria, library, laboratory, and similar places.)
- *The strength of naturalistic observation* is "ecological" validity of data because behavior flows naturally. Close study of a classroom or school situation through observation can bring also new ideas about possible interventions.
- *Some of the limitations of participant observation* are: inability to manipulate variables to make causal inferences; lack of representativeness of sample, which hinders generalization or application of conclusions to other groups; less *reliable* observations than those conducted in controlled or contrived set-ups; and the necessity of training for observer to appreciate distinctive aspects of situation to be studied.

## 3 Participant observation

- The researcher becomes part of the group being studied.
- One *strength* of this type of observation is that greater understanding of the lives of the group being studied is obtained.
- *Among the limitations of participant observation* are: difficulty in making notes while observing; greater reliance on memory; decreased objectivity and greater bias; and "selective" observation such that some "negative" observations may be omitted, thus reducing the validity of data.

Among the three, naturalistic and participant observations are the most practical to be used in Action Research. However, when the research question warrants it and a classroom with one-way mirror is available, controlled observations is also workable for Action Research.

## SAMPLING METHOD AND DATA TO BE RECORDED

*Random sampling* is feasible for controlled observations. Since you as the researcher have "control" of the observation setting, you can also randomly select participants and, likewise, assign them to contrived situations.

*Nonrandom sampling* methods are more realistic for Action Research, particularly when naturalistic and participant observations are employed. Since observations are happening in real life and in real time, you may have to observe *whoever* is present at the time of the observation (*accessible sampling*). In a class, you may also select specific students to be observed depending on certain *characteristics;* say, only those identified as at-risk, aggressive, or maladjusted (*purposive* or *purposeful sampling*). The number of students representing subgroups (such as 2 males and 3 females) may also determine the students that you observe (*quota sampling*). Having observed one class, you may ask the teacher for referral as to which class can be observed next. For example, in studying *learner-centered instructional approach*, you may ask for names of teachers who are known to use this technique (*snowball sampling*).

Aside from the population sample, you as observer also have to settle on the specific behavior that will be recorded. The following are three ways of deciding which specific behavioral data will be collected.

### 1 Event sampling

The *specific types of behavior* (called *events*) are chosen and only observations during the occurrences of these are recorded. Other types of behavior are not attended. For example, let us say a teacher is implementing an intervention to increase student engagement during class discussions. As an observer, you focus only on all behavior when the teacher asks questions during lectures and record students' responses and other behavior when the teacher initiates an exchange with students. Behavior that do not fall into this category are disregarded.

### 2 Time sampling

The *specific period of time* during which observation will be conducted is determined. Only the behavior exhibited during the designated period are recorded for analysis. For example, another approach in collecting data about student engagement is to record behavior during the *middle* 20 minutes of every hour. If classes begin at 7:30, the observations are made at 7:50, 8:50, 9:50, and so on. Only the behavior manifested during the given period of time are noted. Behavior occurring before or after the assigned period are not recorded.

3 **Instantaneous (target time) Sampling**
The *specific moments* to be observed are decided ahead of time. Behavior that occur during these moments are recorded; all others are ignored. Using the study on student engagement, an example of these *moments* might be class discussions conducted by the teacher. Observations are conducted only during this segment of the class session. Other segments during class time are not subjected to the observation.

## DATA COLLECTION METHODS

Observations may be recorded through the following tools.

1 **Field notes**—The observer writes in a notebook verbal descriptions of what has been seen, heard, and experienced, including meaningful statements that have been said. Full transcriptions of these notes must be made before embarking on data analysis.
2 **Audio and video recordings**—The observer uses electronic equipment such as tape recorder or video camera to record the event/s. Full transcriptions of these recordings are eventually made in preparation for data analysis.
3 **Rating scales**—The observer records the intensity, prevalence, or degree of behavior observed using a rating scale.
4 **Checklists**—The observer, aided by a list of important behavior, simply checks or marks those that are seen in the respondents. Some checklists have columns labelled "present," "observed," or "yes" where check marks may be placed to indicate whether the behavior has been observed or not.
5 **Anecdotal records**—The observer prepares detailed written accounts of important events and behavior without any interpretations.

## DATA ANALYSIS TECHNIQUES

The following are the different techniques in analyzing data gathered through observation.

1 *Qualitative* data analysis is the data analysis technique for information gathered using field notes, audio and video recordings, and anecdotal records. Themes are extracted from the initial reading of the transcripts; then, specific behavior and/or statements uttered by the participants are categorized in line with the themes. Presence of behavior can be tallied and a frequency table for the themes can be created.

2. *Quantitative* or statistical analysis is applied for data collected from rating scales and checklists. Descriptive statistics such as measures of central tendency (mode, median, and mean) and variability (range, variance, and standard deviation) are often calculated for each item and/or the entire scale or checklist. Another statistic that can be used with these data is the correlation coefficient to describe relationship between variables that may be of value to the study. Inferential statistics such as *t*-test and *F*-test may be computed if comparisons between or among groups are relevant to the research.

**Note:** More detailed discussions on these statistics and on qualitative analysis are provided in the sections devoted to them.

## GUIDELINES FOR CONDUCTING OBSERVATIONS

The following are some things to consider as you conduct observations for the data gathering of research.

1. *Be inconspicuous*. Except in controlled observations, it is more beneficial for the research if you are neither known to nor are noticed by the participants as the observer. It helps if you spend some time with the students before you actually begin the observation to allow them to get used to your presence.
2. *Be objective and specific*. When writing your observation notes, be sure to describe behavior using clear, accurate, and standard terms or words. Keep in mind the behavior that is being studied and avoid putting your interpretation of it as part of your observation notes. You may, however, write your impressions and interpretations of what you have observed on a separate column or page, properly labelled as such.
3. *Be systematic and thorough*. Make sure that your observation notes or recordings are precise and faithful to the actual event. The notes should also be as thorough as you can make them. These should also be logically arranged, and should include only what has been seen and heard.

## ETHICAL CONSIDERATIONS

The highest ethical standards should also be followed during observations. First, *permission* from parents, administrators and others concerned should be sought before conducting observations. Second, *protection of the participants' rights* should be always ensured. Code names or pseudonyms should be used in place of full names of participants. Also, data collected from observations must be kept in strictest confidence. These include field notes, audio and video recordings, rating scales, and

checklists that have been used during the observation. These must all be stored in a safe place. Other than fellow researchers or teachers in the research team, these documents and materials should not be accessible to any unauthorized individuals.

## PRACTICE/EXERCISE

The following is an observation checklist on student behavior in the classroom. See if you can use this in a class of a fellow teacher. Ask permission from the teacher concerned and from your superiors and inform them of this exercise as part of the Action Research Teachers' Guide.

During the observation, use the following *checklist* to indicate the presence or absence of each behaviour. Put a ✓or ✗ in the box beside each behaviour. Utilize the space below the sections to make notes on specific behavior you have observed that are relevant to the items on the list.

| **Student classroom behavior checklist** | | | |
|---|---|---|---|
| Student: | Teacher: | Time: | Date: |
| No. of absences: | Subject: | Grade Level | No. of disciplinary cases: |
| **Positive behavior** | **Negative behavior** | **Additional behavior concerns** | |
| | | | |
| ☐ follows rules | ☐ disrupts class | ☐ hyperactive or nervous | |
| ☐ positive self-esteem | ☐ disrespectful towards teacher | ☐ easily distracted | |
| ☐ sense of empathy | ☐ disrespectful towards peers | ☐ dramatic; attention-getting | |
| ☐ thinks before acting | ☐ physically aggressive | ☐ expresses low self-esteem | |
| ☐ is a leader | ☐ gets out of seat w/o permission | ☐ dishonest | |
| ☐ others: | ☐ others: | ☐ others: | |
| | | | |
| **Notes:** Other observations | | | |
| | | | |
| | | | |

## REFERENCES


Kawulich, Barbara. 2012. "Collecting Data through Observation." ResearchGate (website). Accessed May 21, 2018. https://www.researchgate.net/publication/257944783_Collecting_data_through_observation.

McLeod, Saul. 2015. "Observation Methods." Simply Psychology (website). Accessed May 21, 2018. https://www. simplypsychology.org/observation.html.

Mertler, Craig A. (2011) 2014. *Action Research: Improving Schools and Empowering Educators*. Thousand Oaks, California: SAGE Publications.

Mills. George E. (1997) 2017. *Action Research: A Guide for the Teacher Researcher*. New York: Pearson.

Nugent, Glenda, Sakil Malik, and Sandra Hollingsworth. 2012. *A Practical Guide to Action Research for Literacy Educators.* Washington, DC, USA: Global Operations Unit, International Reading Association.


## NOTES / SIDEBAR

**Tip:** Plan prior your observation. Indicate the context and setting and describe what might influence the observation before its conduct. During observation, record notable characteristics relevant to your topic. As much as possible, write down, a full description of the student's behavior during the observation. You can utilize checklists, field notes, and audio or video equipment. You can also devise your own shorthand note and later transcribe it to a thorough and complete description.

SECTION 4.5

# DATA COLLECTION THROUGH DOCUMENTS AND MATERIALS

# OBJECTIVES

At the end of this section, the reader will be able to:

1. identify documents and materials that can used as data or sources of data in Action Research or preliminary study;
2. differentiate primary and secondary documentary sources;
3. explain the purposes of external and internal criticism in using documents and materials as data or data sources;
4. demonstrate awareness on ethical concerns in the use of documents and materials as data and/or sources of data; and
5. formulate Action Research questions that will require documents and materials as the primary method for collecting data.

# INTRODUCTION

If the research question drives the Action Research, data *fuel* the engine of the research process for the researcher to arrive at his or her intended destination, which is the answer to the research question. For this reason, data collection must be well-planned. The most appropriate method of data collection must be applied following the principles and guidelines pertinent to it. So far, three data collection methods have already been introduced: paper-and-pencil instruments, interviews, and observations.

This section will complete the discussion on data collection methods by presenting the use of documents and materials as both data and as method of obtaining information for the research. Sometimes, the data needed for Action Research or preliminary research (Assessing the situation, stage 1 of the Action Research framework) cannot be obtained from paper-and-pencil instruments, interviews, or observations. There are times when data can only be derived from documents or materials produced by the participants themselves.

# STEPS/KEY CONCEPTS

## DOCUMENTS AND MATERIALS AS DATA AND/OR SOURCES OF DATA

- *Documents* and *materials* that can be used as data or data source for Action Research are those that contain specific information about the research participants that *cannot* be acquired through paper-and-pencil instruments, interviews, or observations.

- Sometimes, an Action Research needs information that are *generated* by the students themselves. That is when documents and materials become the preferred data or data source. For example, a teacher may want to help his or her Grade 7 students understand how to solve algebraic problems. He or she may first examine errors in the students' computation. One way to do these is to scrutinize their *assignment notebooks*. Another example is when a teacher wishes to improve his or her instructional strategies. He or she may consider examining the *Self-Reflection* page of the students' *portfolios*.
- Assignment notebooks and portfolios are examples of documents and materials produced by students that are appropriate as data or source of data for preliminary research or Action Research.

## PRIMARY AND SECONDARY DOCUMENTARY AND MATERIAL SOURCES

The following are some examples of primary and secondary documentary and material sources that can be used in research.

### 1 Primary documentary and material sources

- These are *original* outputs that may be used as data or as sources of data for preliminary research and Action Research.
- These include written or non-written evidences, such as sound recording, pictures or photographs, and artifacts that provide *direct* and *firsthand* information about students or events involving them.
- Published materials are also considered as primary documentary sources as long as they are generated by someone (e.g., a student) who is the subject of the study within the time period covered by the study.
- The significance of primary documentary and material sources is that they express the individual *viewpoint* and *activity* of a research participant. In scientific research, they convey *original* thinking or thought processes, personal sentiments and views, and activities done *in private* that are difficult to obtain using other data collection methods.
- Examples are autobiographies, diaries, and memoirs; personal letters and correspondences; internet communications on emails, blogs, social media groups, and newsgroups; photographs, drawings, and posters; works of art and literature; books, magazines, newspaper articles, and ads published *at the specific time* encompassed by the study; public opinion polls; speeches and oral histories; official personal documents such as birth certificates, report cards, grades, and transcripts of academic records;

official and unofficial teacher and/or school records that contain statistical information or data about a school such as enrollment, retention, dropout, and promotion rates; artifacts of all kinds such as subject notebooks, assignments, portfolios, term papers, and projects (both written and objects); audio recordings, DVDs, and video recordings of student events; and technical reports and scientific journal articles reporting experimental research results.

### 2 Secondary documentary sources

- These refer to written documents and audio-visual materials (e.g., pictures, video clips) that *explain*, *examine*, *clarify*, *analyze*, *criticize*, *assess*, *review*, and *sort out* primary documentary and material sources.
- These assemble, organize, and summarize information provided by primary documentary and material sources mainly with the objective of extensively circulating the information and turning them into a more usable format.
- These are ranked lower than primary documentary and material sources because these do not possess the uniqueness and distinctiveness of the original documents.
- Examples are bibliographies, biographies, reference books, and articles from magazines, journals, and newspapers written and published after the event; literature reviews and review articles; history books and other popular or scholarly books; works of criticism and interpretation; commentaries; text-books; and indexes and abstracts.

## SPECIFIC DOCUMENTS AND MATERIALS AS DATA AND/OR SOURCES OF DATA

Listed are some documents and materials that can be used as data or data source depending on the subject of your preliminary research or Action Research.

### 1. Sources about students

- written assignments
- projects
- students' records (anecdotal record, attendance, report cards, test reports)
- students' portfolio

### 2. Sources about teachers

- lesson plans
- classroom observation tools
- minutes of meetings
- print materials (journals, school paper, photographs, letters, diaries, memos)
- nonprint materials (objects, teaching aids, audio-video recordings)

The following table shows examples of documents and materials that may be used for the given research topics.

| Research topic | Documents and materials as data/data source |
|---|---|
| case study of teacher intervention on one low-performing Mathematics student | anecdotal record, report card, test report, student portfolio, written assignment, project |
| enrollment trend in multi-grade schools for the past five (5) years | school report card of multi-grade schools |

## EXTERNAL AND INTERNAL CRITICISM

Documents and other materials may be scrutinized in two ways.

### 1 External Criticism

- It is the practice of inspecting the *authenticity* of documents and materials to be used as data and/or data sources in preliminary study and Action Research.
- *Genuineness* or *validity* of the document must be established before it is considered as data or data source. It is the researcher's duty to first certify the authenticity of the document or material so that it would not affect the possible result of the study.
- This process answers important questions like "Is the document or material what it looks to be or declares to be?" and "Is it appropriate as data or source of data for the research?"
- Features inspected for external criticism are as follows:
  - **a.** *Language and writing style*-— should be expected of the author or creator and consistent with his or her other works
  - **b.** *Physical appearance*—quality of paper and format or tangible features should be consistent with the period in which it is said to have been produced
  - **c.** *Authorship*—must be known, mentioned, and acknowledged in keeping with the characteristics or qualifications of originator/s

### 2 Internal Criticism

- It concerns *correctness* of what a document says.
- The accuracy of the content of a document must be examined by the researcher.
- This process seeks answers to queries such as "Is the content of the document the truth?" and "Is what the document saying consistent with recognized facts about the writer and/or the topic?"

- The logical deduction is that if a document or material has been declared to be genuine, then what it contains must be true. However, it can happen that a document and its author are authentic, but if the document or material is generated through coercion or compulsion, its contents may *not* be truthful. It might also happen that the author is *biased* and, therefore, presents only half the truth in the document. This is the reason why internal criticism has to be undertaken even if the authenticity of the document or material has already been ascertained.
- Aspects considered in internal criticism are the following:
  a. *Meaning*—implications of words and statements must be in harmony with known facts
  b. *Credibility*—words and statements must be reliable and trustworthy

### ETHICAL CONSIDERATIONS

In using documents as data and/or means to obtain data, the Action Researcher should consider and follow these ethical practices.

1. *Proper permission.* Official permission should be secured for all documents that will be examined for the research.
2. *Confidentiality.* Identities of individuals who produced the documents must be kept confidential. Documents and materials should be cited anonymously. If names have to be used, code names or pseudonyms should be supplied. All documents and materials should be kept in a secure place that cannot be accessed by anyone other than the researcher/s.
3. *Authenticity of the documents.* The researcher must ensure the trustworthiness of documents and materials and the soundness of their contents. Documents and materials from questionable sources and with doubtable content should be excluded in the study.

## PRACTICE/EXERCISE

Study each research question and decide what document/s and/or materials can serve as data and/or sources of data in the search for answers. Write these in the spaces provided.

| | Research questions | Document/s and/or material/s to be used |
|---|---|---|
| 1 | What is life like for a student with a non-traditional home situation (e.g., OFW parent or separated parents)? | |

| | | |
|---|---|---|
| 2 | What are the most prevalent discipline problems of elementary pupils, as reported to school authorities, and how were they addressed? | |
| 3 | What are the characteristics of teaching materials found in Learning Resources Management and Development System (LRMDS) portal? | |
| 4 | What career programs or activities may be developed for Senior High School students? | |
| 5 | What are the learning difficulties of Primary pupils in terms of Filipino grammar? | |

You may compare your answers with the suggested ones provided at the end of this section.

## REFERENCES


Department of Education. 2017. Supplemental Research Guides and Tools. DM 144, s. 2017.

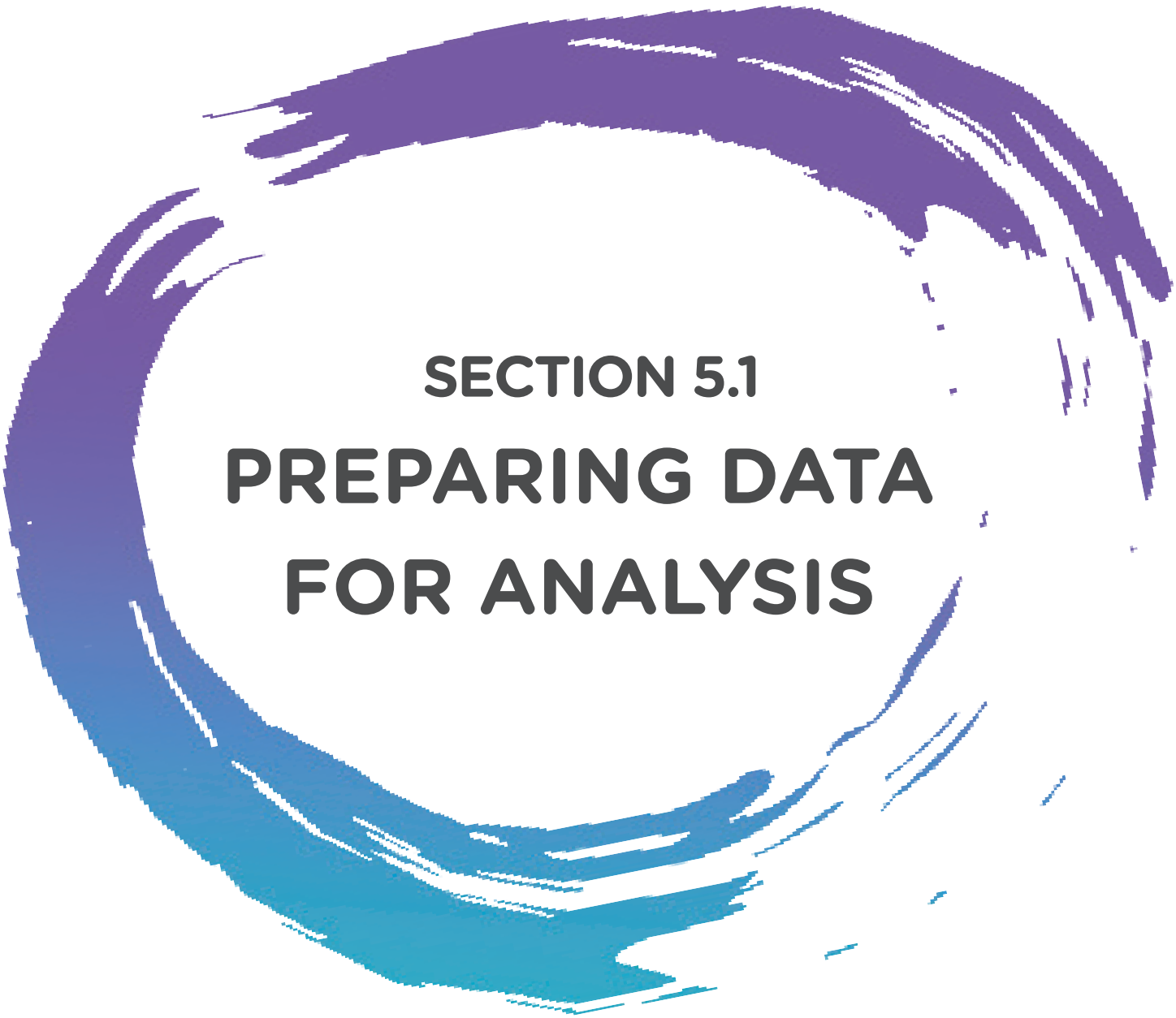
Santiago Canyon College. n.d. "Identifying Primary and Secondary Sources." Santiago Canyon College (website). Accessed May 21, 2018. https://sccollege.edu/Library/Pages/primarysources.aspx

McKernan, James. (1991) 1996. *Curriculum Action Research: A Handbook of Methods and Resources for the Reflective Practitioner*. London: Kogan Page.

Mills, Geoffrey E. (1999) 2017. *Action Research: A Guide for the Teacher Researcher.* Boston: Pearson.


### SAMPLE ANSWERS FOR PRACTICE/EXERCISE

| | Research questions | Document/s to be used |
|---|---|---|
| 1 | What is life like for a student with a non-traditional home situation (e.g., OFW parent, separated parents)? | students' diaries |
| 2 | What are the most prevalent discipline problems of elementary pupils as reported to school authorities and how were these addressed? | records from the discipline officer |
| 3 | What are the characteristics of teaching materials found in Learning Resources Management and Development System (LRMDS) portal? | teaching materials in the LRMDS portal |
| 4 | What career programs or activities may be developed for Senior High School students? | Senior High School track selections |
| 5 | What are the learning difficulties of Primary pupils in Filipino grammar? | students' essays in Filipino |



SECTION 5.1

# PREPARING DATA FOR ANALYSIS

# OBJECTIVES

At the end of this section, the reader will be able to:

1. differentiate the four levels (scales) of measurement of data;
2. identify critical points to be considered when preparing data for analysis;
3. prepare a coding guide for a data collection instrument; and
4. encode data using the coding guide prepared.

# INTRODUCTION

Data analysis is a major step in Action Research. It is during this process that information collected from research participants through various data collection methods are synthesized to derive conclusions that would answer the Action Research question.

Preparing data for analysis is a necessary and crucial intermediary process by which responses are coded electronically for the purpose of analysis.

This section discusses the important things to think about as data are prepared for analysis. The parts of a coding guide are also introduced. An exercise on preparing a coding guide for given data and then applying it is also provided to help you develop this important skill in preparing data for analysis.

# STEPS/KEY CONCEPTS

## LEVELS OR SCALES OF MEASUREMENT

*Measurement* is the process of assigning *numbers* to variables. This facilitates statistical analysis of quantitative data. The following are the four levels of scales of measurement.

1. **Nominal level/scale**—Numbers are assigned for *naming* or *labelling* purposes only. For example, for the variable gender, "*Male*" can be assigned the number "1" and "*Female,*" the number "2." The numbers "1" and "2" mean "Male" and "Female" respectively. On a spreadsheet, under the column designated for gender, we know that the participant is a male every time we see a "1" and a female every time we see a "2." If a researcher chooses another pair of numbers, say "0" for "Male" and "9" for "Female", this is also acceptable.
2. **Ordinal level/scale**—Numbers assigned signify some kind of *ranking*. For example, in the variable honors, ranking is presented as *First Honors*, *Second Honors*, *Third Honors,* and so on. Numbers "1," "2," "3," etc. are assigned to these

academic positions, respectively. Aside from labelling, these numbers also have some *order* so that we know that "1" is higher than "2," "2" is higher than "3," "3" is higher than "4," and so on.

3 **Interval level/scale**—Numbers correspond to *equal intervals* between values, but have only an *arbitrary* zero value. This means that the variable may take *positive* and *negative* values. An example of a variable with an interval level is Intelligence Quotient (IQ). The 10-point difference between IQ of 100 and IQ of 110 is the *same* 10-point difference between IQ of 80 and IQ of 90. The average (IQ of 100) is the "arbitrary zero" and IQ values are placed either to the right (positive) or to the left (negative) of this arbitrary zero value.

4 **Ratio level/scale**—Numbers convey *equal intervals* like interval level/scale, but unlike it, there is an *absolute* or *true* zero value. In ratio level, "Zero" (0) means that the participant does not have the trait or characteristic at all. Therefore, there are no negative values. The range of values begins at "0."

Nominal is the lowest level and ratio is the highest. "Lowest" does not mean inferior and "highest" does not mean superior. These terms refer only to the degree of sophistication in statistical analysis. For example, variables with nominal level/scale of measurement can only be counted, while those with ratio level/scale can be subjected to inferential statistics. The following table shows different statistical techniques that can be applied to variables with different levels/scales of measurement.

| LEVEL OF MEASUREMENT | STATISTICAL ANALYSIS |
|---|---|
| Nominal | Count (Frequency)<br>Percentage<br>Bar graph/Pie chart<br>Mode<br>Chi square |
| Ordinal | Count (Frequency)<br>Percentage<br>Bar graph/Pie chart<br>Mode, Median<br>Chi square |
| Interval and Ratio | Count (Frequency)<br>Percentage<br>Bar graph/Pie chart, Frequency polygon<br>Mode, Median, Mean<br>Range, Variance, Standard deviation<br>Correlation, Regression<br>*t*-test, *F*-test |

## DATA SORTING AND CLEANING

Before encoding quantitative or qualitative data for analysis, these should first be subjected to the following preliminary procedures.

1. **Data Sorting**—This refers to the *physical* weeding out of tests, questionnaires, and documents that are not valid. This includes the removal of incomplete tests, questionnaires, and rating scales, as well as documents of questionable origin in the pile of data. Only those data and/or data source that contain information that will be useful for the study are compiled for data coding.

   As much as possible though, we should not have to exclude any data. It is advised then that when administering tests, questionnaires, and similar instruments, the output of the participants are checked first before dismissing them. Quickly look over them when they are submitted and request the participants to answer all the items.

2. **Data Cleaning**—This refers to the *electronic correction* of seemingly doubtful data. Take note that there might be errors in encoding even if the *data* encoder is an experienced one. These errors can be detected by scrutinizing entries for each variable. One of the telltale signs is *extreme values* like extremely *low* or extremely *high* numbers.

   These "outliers" should be identified, and the original test or questionnaire should be retrieved to find out if the extreme value is a valid one or a computer coding error. If it is an error, it must be replaced with the correct entry. If it is a valid value, then the researcher can either decide to retain it or remove it from the data to be analyzed. Some statisticians advice the deletion of extreme values because they somehow skew the results.

## THE CODING GUIDE OR CODEBOOK FOR QUANTITATIVE DATA

Quantitative data may be analyzed using statistical software; thus, they have to be encoded on a spreadsheet. To guide data encoders on where and how to enter specific values of variables on the spreadsheet, a *coding guide* or *codebook* should be prepared.

The coding guide is a table that shows which variable is found in a specific column on the spreadsheet. It also contains the values assigned to classifications of a categorical variable. It becomes more useful if it also mentions the specific level or scale of

measurement for each variable. It serves as a guide for the researcher on which statistics are appropriate for variables.

Examine the following data set showing posttest scores in a 10-item Language test following the 6-month Intensive English Training.

**TABLE 5.1.1.** Posttest scores in a 10-item language test.

| POSTTEST SCORES IN LANGUAGE | | | |
|---|---|---|---|
| EXPERIMENTAL GROUP | | CONTROL GROUP | |
| Girls | Boys | Girls | Boys |
| 6 | 8 | 4 | 6 |
| 5 | 7 | 5 | 5 |
| 7 | 9 | 4 | 4 |
| 6 | 7 | 3 | 5 |
| 5 | 10 | 4 | 6 |
| 6 | 8 | 5 | 5 |
| 5 | 9 | 4 | 4 |
| 7 | 7 | 3 | 5 |
| 6 | 7 | 5 | 6 |
| 7 | 8 | 3 | 4 |

The coding guide for the set of data should observe the following:

- Every participant should be given an ID number. Test papers, questionnaires, rating scales, observation sheets, and similar documents can be arranged in some kind of sequence, say alphabetically, then assigned an ID number. The ID number can be placed on the upper right-hand corner of the document paper. This links the electronic data with the actual hard copy of the data. The ID number is also a way of protecting the privacy and protection of the identity of the research participant. Hence, the ID number occupies the first column on the spreadsheet. Since the purpose of the ID number is simply to tag or label each participant, it has a nominal level of measurement.
- The coding guide should show that the column after ID number is devoted to group membership of the participant. In this case, the group is either experimental (coded as "1") or control (coded as "2"). Again, the numbers are used only for labelling, so the "group" as a variable takes nominal level of measurement.
- The third column should be assigned to the variable gender. Like the variable group, gender also has two categories, girls (labelled as "1") and boys (labelled as "2"). Like ID number and group, gender also assumes a nominal level of measurement.

- The fourth column should be allotted to posttest score. This variable is a continuous one with a ratio level of measurement.
- You might be wondering why there is a *variable name* and a *variable label*. This is because in many statistical software, the variable name can have only *eight* (8) characters. So, the variable name is a *truncated* (or abbreviated) term for the variable. For example, the variable posttest score can simply be given the variable name "score." The *complete* term for the variable is its variable label. Writing the variable label for each variable facilitates interpretation of computer outputs showing the results of analyses.

**TABLE 5.1.2.** Sample coding guide for quantitative instruments/items.

| COLUMN NUMBER | VARIABLE NAME | VARIABLE LABEL | VALUE | VALUE LABEL | LEVEL OF MEASUREMENT |
|---|---|---|---|---|---|
| 1 | ID | ID number | as is | | nominal |
| 2 | group | group | 1 | experimental | nominal |
| | | | 2 | control | |
| 3 | gender | gender | 1 | girls | nominal |
| | | | 2 | boys | |
| 4 | score | posttest score | as is | | ratio |

- Data from quantitative instruments or data on quantitative items are then entered on a spreadsheet following the coding guide or codebook.
- When the coding guide is applied to the data to create a spreadsheet file, it will look like the figure below.

**TABLE 5.1.3.** Sample encoded data based on the coding guide.

| ID | Group | Gender | Posttest Score |
|---|---|---|---|
| 1 | 1 | 1 | 6 |
| 2 | 1 | 1 | 5 |
| 3 | 1 | 1 | 7 |
| 4 | 1 | 1 | 6 |
| 5 | 1 | 1 | 5 |
| 6 | 1 | 1 | 6 |
| 7 | 1 | 1 | 5 |
| 8 | 1 | 1 | 7 |
| 9 | 1 | 1 | 6 |
| 10 | 1 | 1 | 7 |
| 11 | 1 | 2 | 8 |

| | | | |
|---|---|---|---|
| 12 | 1 | 2 | 7 |
| 13 | 1 | 2 | 9 |
| 14 | 1 | 2 | 7 |
| 15 | 1 | 2 | 10 |
| 16 | 1 | 2 | 8 |
| 17 | 1 | 2 | 9 |
| 18 | 1 | 2 | 7 |
| 19 | 1 | 2 | 7 |
| 20 | 1 | 2 | 8 |
| 21 | 2 | 1 | 4 |
| 22 | 2 | 1 | 5 |
| 23 | 2 | 1 | 4 |
| 24 | 2 | 1 | 3 |
| 25 | 2 | 1 | 4 |
| 26 | 2 | 1 | 5 |
| 27 | 2 | 1 | 4 |
| 28 | 2 | 1 | 3 |
| 29 | 2 | 1 | 5 |
| 30 | 2 | 1 | 3 |
| 31 | 2 | 2 | 6 |
| 32 | 2 | 2 | 5 |
| 33 | 2 | 2 | 4 |
| 34 | 2 | 2 | 5 |
| 35 | 2 | 2 | 6 |
| 36 | 2 | 2 | 5 |
| 37 | 2 | 2 | 4 |
| 38 | 2 | 2 | 5 |
| 39 | 2 | 2 | 6 |
| 40 | 2 | 2 | 4 |

## ENCODING QUALITATIVE DATA

Data collected from open-ended questionnaires, interviews, observations, and documents undergo qualitative analysis. This is a technique that essentially entails deriving "themes" from responses (discussed in more detail in another section). Hence, data coding for qualitative data is done on a word processor. Each response for each question or item is entered verbatim on a table that looks like the one below and marked by an ID or code number for its source.

TABLE 5.1.4. Sample encoding for qualitative data

| **Responses to the question** "What difficulty/ies do you have in Math?" | |
|---|---|
| **ID/Code number** | **Response** |
| 01 | Understanding word problems |
| 02 | Fractions |
| 03 | Factoring |
| 04 | When there is an algebraic equation to be solved |
| 05 | Mostly the lessons in Geometry, especially the sine, cosine, etc. |

## PRACTICE/EXERCISE

Do the following exercise on coding guide and data coding individually.

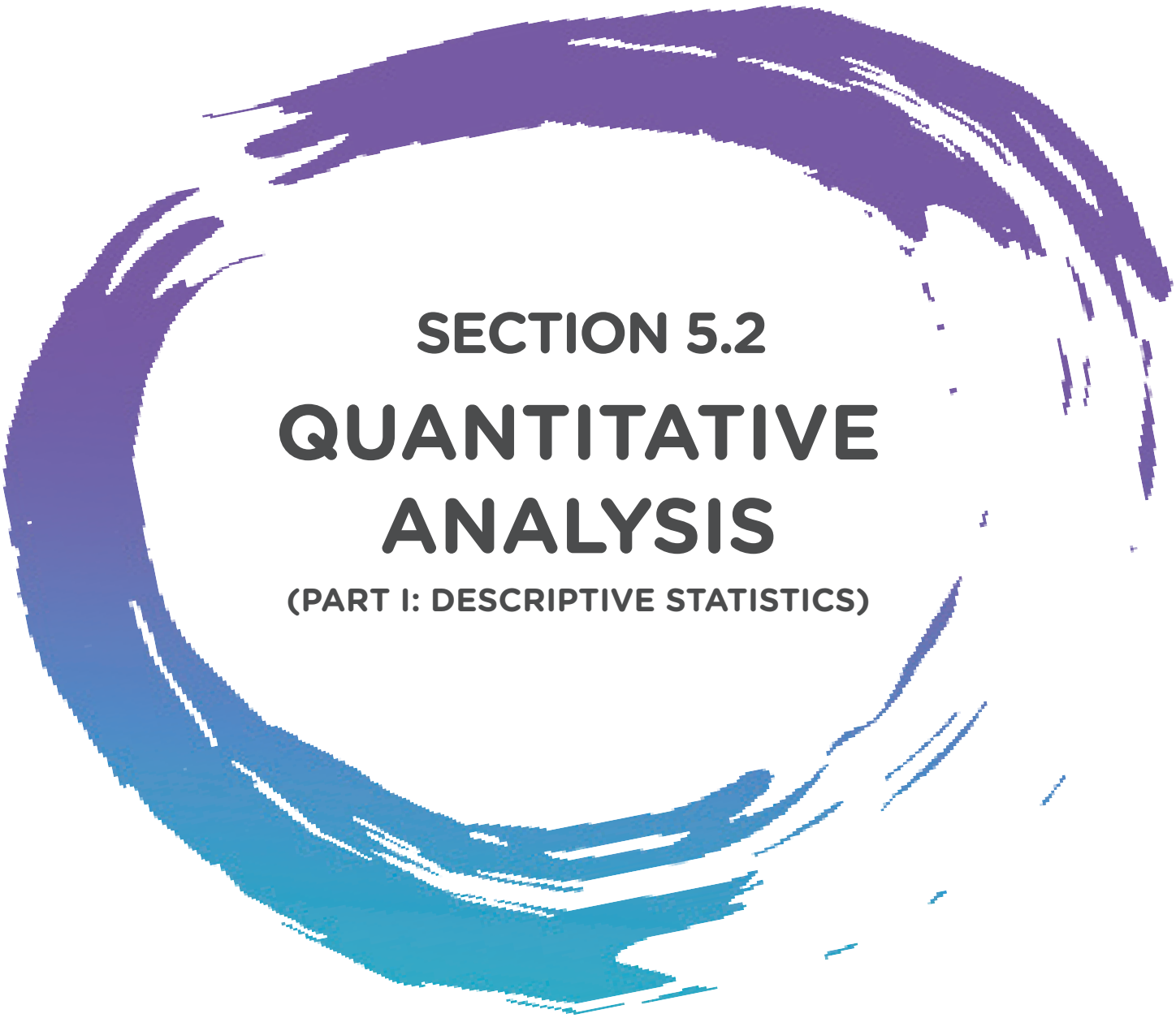
1. Find a short test, rating scale, questionnaire, or checklist.
2. Prepare a coding guide for all information found in the instrument. Remember that each item *is* a variable. Include also the demographic information that might be relevant in the analysis of data.
3. Encode at least ten (10) cases or participants who have completed the test, rating scale, questionnaire, or checklist on a spreadsheet, following the coding guide that you developed.
4. Check your work after encoding data to make sure each piece of information is entered accurately.
5. Bring the coding guide and the data you encoded on the next LAC session.

## REFERENCES


Creswell, John W. (1994) 2009. *Research Design: Qualitative, Quantitative, and Mixed Methods Approach.* Thousand Oaks, CA: SAGE Publications.

Taylor-Powell, Ellen and Marcus Renner. 2003. *Analyzing Qualitative Data*. Madison, Wisconsin: University of Wisconsin-Extension: Program Development and Evaluation.

Business Dictionary. n.d. "Data Analysis." Business Dictionary (website). Accessed May 2018. http://www.businessdictionary.com/definition/data-analysis.html.



# SECTION 5.2

# QUANTITATIVE ANALYSIS

## (PART I: DESCRIPTIVE STATISTICS)

# OBJECTIVES

At the end of this section, the reader will be able to:

1. distinguish different descriptive statistics;
2. use Excel Add-ins (Analysis ToolPak) in computing measures of location, variability, and relationship; and
3. interpret the descriptive statistics computed.

# INTRODUCTION

If you are going to measure the effectiveness of an intervention or treatment in solving a problem or issue in your classroom, how will you go about it? How will you decide if the intervention or treatment has been effective? If the intervention is supposed to help increase achievement, what do you expect the experimental group to attain in comparison to a control group? Which group do you expect to do better or get higher scores?

Suppose you are teaching a Grade 1 class. How would yoau describe the variability or spread of the test scores at the beginning of the school year? What might happen to the said variability after you teach them? Have you ever wondered if there is a connection between performance in school and innate ability or IQ?

This section introduces you to the specific descriptive statistics that can be used to answer these questions. Descriptive statistics refer to measures of location, variability, and relationship between variables.

# STEPS/KEY CONCEPTS

## DESCRIBING DISTRIBUTIONS GRAPHICALLY

The first thing that researchers can do with data collected from groups is to get their big picture. Graphs are pictures of data that give us ideas on how individuals differ within groups and how groups differ from each other. The following are the different graphs that you can use in your research.

1. **Frequency polygon** – This is a *line graph* showing the *frequency* of occurrence of each score. The X-axis indicates score values while the Y-axis shows frequency for each score value. The data points are connected by a line.

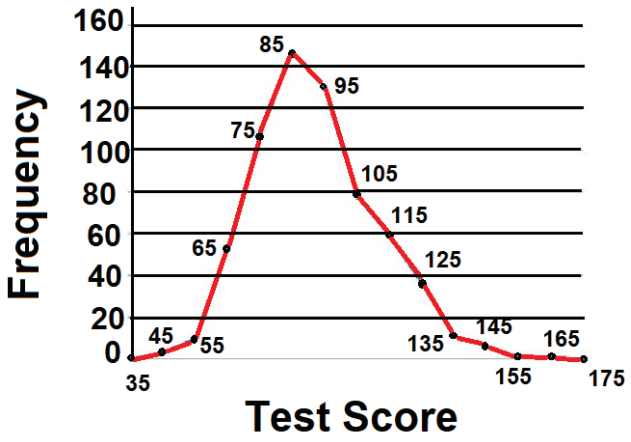



**Figure 5.2.1.** Sample frequency polygon.

**source**: Curiositi; http://www.curiositi.in/worksheets/maths/icse/10/concept/graphical_representation_of_data_using_frequency_polygon_l1/a

2 **Histogram** – This depicts frequencies of appearance of score values or ranges of scores by the *height* of the *bars.*

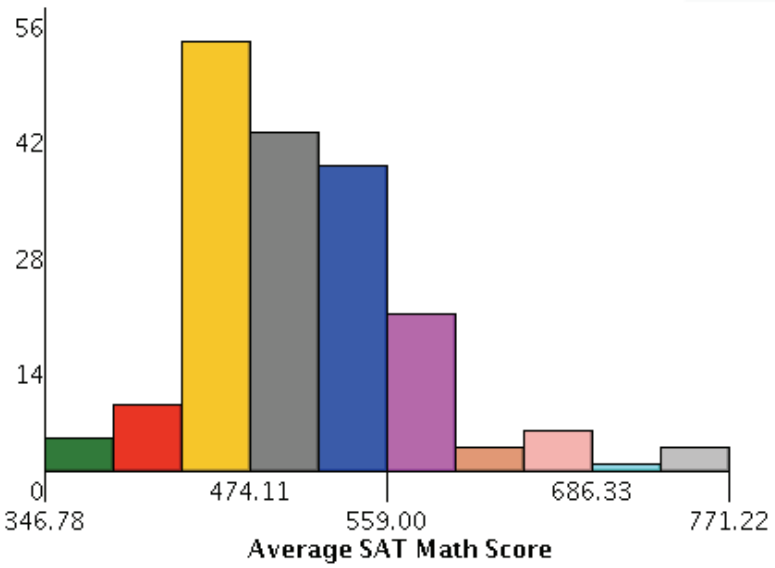



**Figure 5.2.2.** Sample histogram.

**Source**: Shodor: A National Resource for Computational Science Education; http://www.shodor.org/interactivate/discussions/HistogramsVsBarGraph/

3 **Bar graph** – This is similar to line graph and histogram but is used more for *categorical* data. This can be displayed vertically or horizontally.

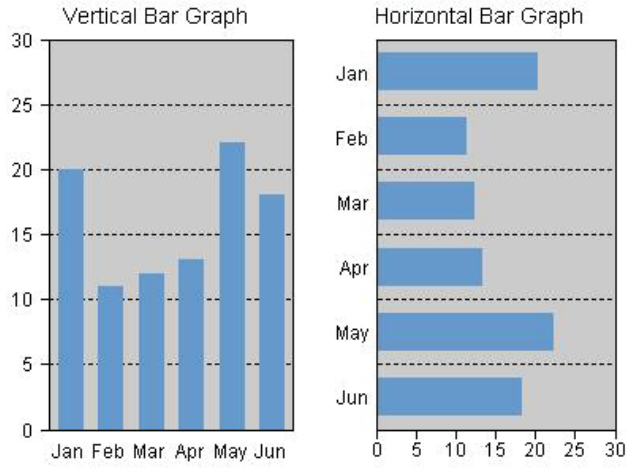



**Figure 5.2.3.** Sample bar graph.

**source**: Mr. Driscoll's Homework:http//www.driscollhomework.weebly.com

4 **Pie chart** (or *pie graph* or *circle chart*) – This is a *circular graph* that is cut into slices to show numerical proportions. The arc length, central angle, and area of each slice are proportional to the quantity depicted.

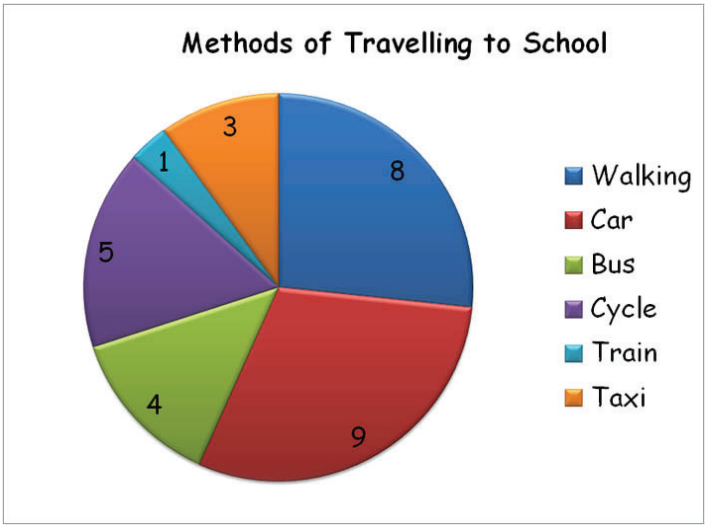



**Figure 5.2.4.** Sample pie chart.

**source**: 11Plus for Parents; *http://www.11plusforparents.co.uk/Maths/handling%20data%204.html*

5 **Pictograph** – This uses *picture symbols* in signifying relative frequency or proportion of levels of a categorical variable.

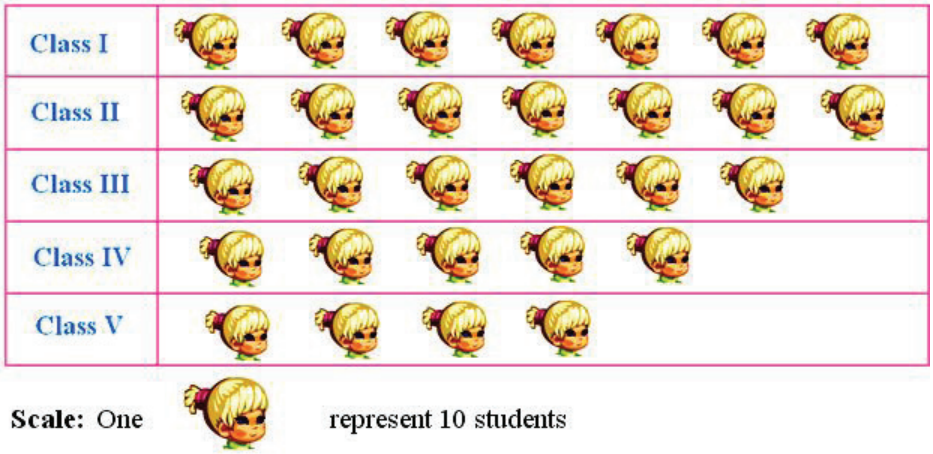



**Figure 5.2.5.** Sample pictograph.

source: Math Only Math; https://www.math-only-math.com/pictograph-to-represent-the-collected-data.html

6 **Scatter plot** (or *scatter gram* or *scatter graph*) – This refers to a graph that portrays relationship between two variables with "cross-point"; one variable is on X-axis, while the other one is on Y-axis. This illustrates weak, moderate, strong, positive or negative linear relationship, or curvilinear relationship.

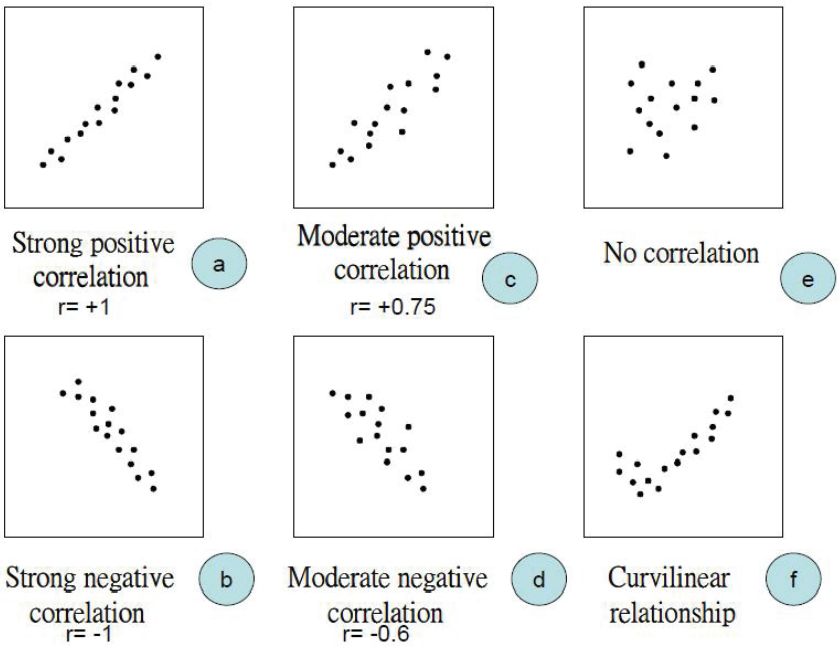



**Figure 5.2.6.** Sample scatter plot.

source: Danis Alfiana Hardani; Blogspot; http://deelocker.blogspot.com/2012/04/correlation-analysis-assignment-for.html

## SYMMETRIC/SYMMETRICAL AND ASYMMETRIC/ASYMMETRICAL DISTRIBUTIONS

There are two kinds of distribution of data: symmetrical and asymmetrical distribution.

1 **Symmetric/Symmetrical Distribution**—In graph form, this refers to the type of distribution wherein the left side is a *mirror image* of the right side. When the graph is divided in the middle, the left and right sides are equally balanced around the mean (mean = median).

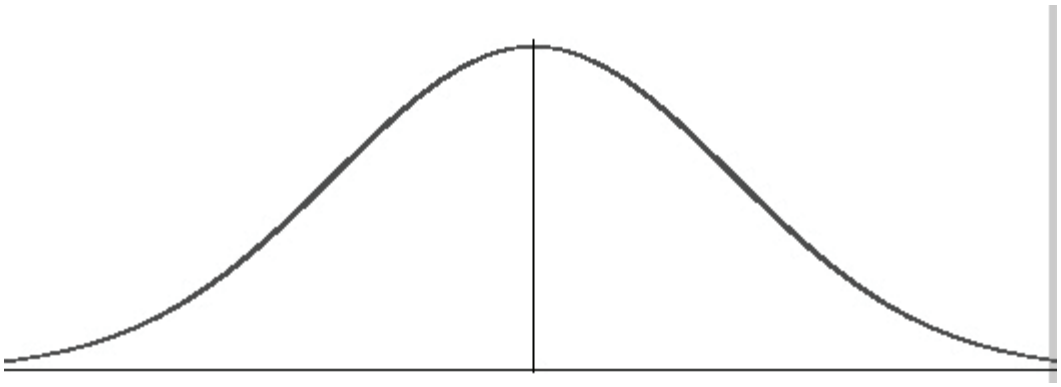


**Figure 5.2.7.** Graph of Symmetrical Distribution

source: Statistics How To; https://www.statisticshowto.datasciencecentral.com/wp-content/uploads/2013/09/normal-distribution-probability.jpg

An example of symmetric or symmetrical distribution is *normal distribution* or *normal curve*. It is also called *bell curve* because of its bell shape and *Gaussian distribution* after Karl Friedrich Gauss, the mathematician who discovered it.

The following are the characteristics of a normal curve.

a symmetrical—When divided in the middle both sides (left and right) are mirror images of each other.
b unimodal—It has only one mode.
c mesokurtic—It is moderately peaked.
d asymptotic—Its tails do not touch the number line to indicate approaching infinity as sample size *n* becomes indefinite.
e equal—The three measures of central tendency (mode, median, and mean) are equal or have the same value.

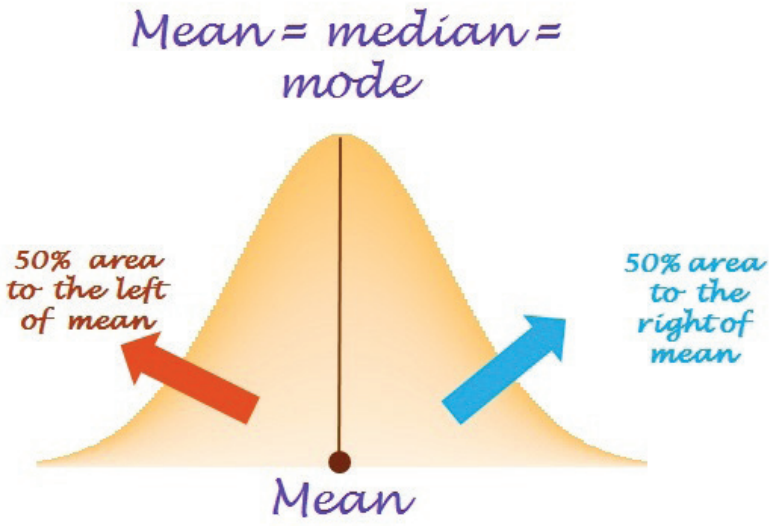



**Figure 5.2.8.** Normal Curve

source: https://www.google.com/search?hl=en-PH&tbm=isch&sa=1&ei=iQpUW93CIZev9QOppWYBQ&q=normal+curve+showing+mode+median+and+mean&oq=normal+curve+showing+mode+median+and+mean&gs_l=img.3...23501.27565.0.27854.29.20.0.3.3.0.321.2533.0j9j4j1.14.0....0...1c.1.64.img..13.5.482...0j0i67k1j0i30k1.0._62y-BYX3kc#imgrc=0_VXmrape7JIdM

2 **Asymmetric/Asymmetrical (or Skewed) Distribution**—This refers to distribution in which the values of variables occur at *irregular* frequencies and the mode, median, and mean occur at *different* points. It exhibits skewness (e.g., lack of symmetry), which can either be negative or positive.

*Negative skewness* (negatively skewed or left-skewed), (see figure 5.2.9 left) indicates that the mode has the *highest* value, the mean has the *lowest* value, and the median is somewhere in *between* the mode and the mean.

*Positive skewness* (positively skewed or right-skewed), (see figure 5.2.9 right) indicates that the mean has the *highest* value, the mode has the *lowest* value, and the median is again *between* the mode and the mean.

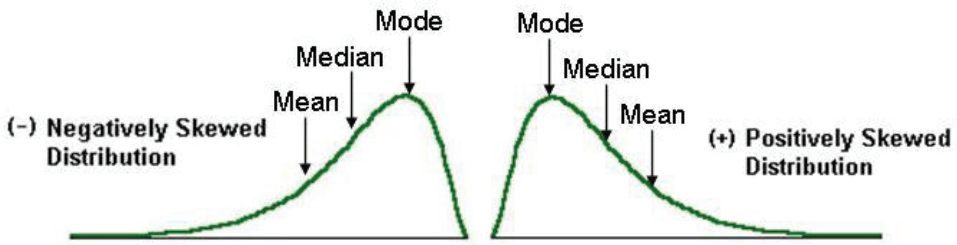



**Figure 5.2.9.** Graph of asymmetrical distribution

Source: Laboratory of Integrated Physiology - University of Houston; http://grants.hhp.coe.uh.edu/doconnor/PEP6305/Topic%20003%20Percentiles%20Central%20Tendency3.2.htm

## DESCRIPTIVE STATISTICS

There are two major ways of characterizing data—through *measures of location* and *measures of variability*.

1 **Measures of location**— These measures allow us to describe data with several different single values according to the point on the number line around which they tend to *cluster* or *converge*. These include mode, median, and mean.

a **Mode**—This refers to the value that appears most *frequently* in a data set. Put in another way, it is the score that has the *highest* frequency.

Examine the following array of literacy scores:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 26 | 25 | 27 | 24 | 25 | 24 | 25 | 23 | 25 | 26 |

If a tally of score values is made, it will be like the following frequency table.

**Table 5.2.1.** Frequency table of literacy scores.

| Literacy score | Frequency |
|---|---|
| 23 | 1 |
| 24 | 2 |
| 25 | 4 |
| 26 | 2 |
| 27 | 1 |

The highest frequency is 4 and the score value that corresponds to that is 25" Therefore, the mode is 25.

Take note that the mode is the most *unstable* measure of location because it simply relies on frequency of occurrence of a *single* score value.

b **Median**—This refers to the *middlemost* point that divides the data set into two *equal* parts. It is also known as the *50$^{th}$ percentile.* It shows that 50% of the data lie below it and 50% above it. It can be found by organizing scores from highest to lowest, or lowest to highest, and then locating the middlemost score.

The sample literacy scores earlier are arranged from lowest to highest. Counting from the lowest or from the highest, the middlemost score is 25.

Therefore, the median is *25*.

23 24 24 25 25 25 25 26 26 27

The formula below is also useful in finding the median, where *n* is the sample size.

Position of the Median = (n + 1)/2

Using the sample data given earlier, the sample size *n* is 10. Applying the formula to find the median, the position is the 5.5th score.

23 24 24 25 25 25 25 26 26 27

Technically, there is no number between 25 and 25. Hence, the median is simply 25.

c **Mean** (symbolized by $\mu$ for population or M for sample)—This is the *arithmetic average* of data, which is computed by *adding* all the values and then *dividing* the sum by the *number* of data or cases. It is the most *stable* among the three measures of location because it takes in *all* scores. It is also the most *sensitive* to *outliers,* scores that are extremely high or extremely low and far from the rest of the scores, possibly because of the variability in the measurement, experimental error, or data entry error. Take note that many researchers *exclude* outliers from the data set since they can lead to erroneous statistical analyses and interpretation of results.

For our array of literacy scores from earlier, the sum is 250. Dividing this sum by the number of scores or cases or the sample size *n*, which is 10, we obtain the mean, which is 25.

The mode, median, and mean have their own appropriate use depending on the level or scale of measurement used. The following matrix shows which measure of location is meaningful for each level of measurement.

| STATISTIC | LEVELS OF MEASUREMENT | | | |
|---|---|---|---|---|
| | Nominal | Ordinal | Interval | Ratio |
| Mode | ✓ | | ✓ | ✓ |
| Median | | ✓ | ✓ | ✓ |
| Mean | | | ✓ | ✓ |

2 **Measures of variability**— These measures allow us to describe data with several different single values according to the extent to which they are alike or are different. These include range, variance, and standard deviation.

a **Range** (R)—This is the simplest of the three measures of variability. It is computed by simply finding the *difference* between the *lowest score* from the *highest score.*

| Range R = highest value — lowest value |
|---|

It is not a *reliable* measure of variability because it is affected by *outliers* or *extreme* scores. It is also the most *unstable* because it relies only on *two* score values, the *highest* and the *lowest*.

In the array of literacy scores earlier, the highest value is 27 and the lowest is 23. The difference between these scores is 5, which is also the range for the literacy scores.

b **Variance** ($\sigma^2$ for population or $s^2$ for sample)—This is the *average squared deviation.* To get this, deviations (symbolized by small letter *x*) must first have to be computed (score minus mean) as shown in the table below. Remember that deviation is the *difference* between a score and the mean (X—M). Then, each deviation has to be *squared* $(X—M)^2$.

The *average* of the squared deviations is then computed. This is accomplished by adding all the squared deviations $(X—M)^2$. In our example, the sum of squared deviations is 12. Divide this by n—1 (12/9), or the degrees of freedom (*Read the Notes/Sidebar provided at the end of this section for explanations on this concept*), which gives us 1.33. This is the variance *s* for the set of data.

| X | X-M | $(X-M)^2$ |
|---|---|---|
| 26 | 1 | 1 |
| 25 | 0 | 0 |
| 27 | 2 | 4 |
| 24 | -1 | 1 |
| 25 | 0 | 0 |

| | | |
|---|---|---|
| 24 | -1 | 1 |
| 25 | 0 | 0 |
| 23 | -2 | 4 |
| 25 | 0 | 0 |
| 26 | 1 | 1 |
| | **TOTAL** | 12 |
| | **Variance** | 12/9 = 1.33 |

c **Standard deviation** (σ for population or s for sample)—This is simply the *square root* of variance. In squaring the deviations, the *unit* of the value is also squared. Hence, 12 is really "*12 points squared*." However, we do not use "points squared." To get to the *original* unit, we need to *extract* the *square root* of variance.

The standard deviation for our set of data earlier is the square root of 1.33, which is 1.15.

Relative values of standard deviations tell us how varied the data points or scores in different groups are. Groups with widely *spread* or quite *varied* data points or scores are depicted as being *heterogeneous*, while those with data points or scores that are quite *alike* or *close* to each other are said to be *homogeneous*. *Lower* standard deviations for the same variable indicate *homogeneity*, while *higher* standard deviations, reflect *heterogeneity*.

One of the important uses of the standard deviation is in *calibrating* the normal distribution. Standard deviation is a unit of measurement that shows *where* students are *likely* to fall. Provided that scores are *normally* distributed, 68% of the students fall within one standard deviation either side of the mean. Put in another way, 68% will have scores that are between -1 and +1 standard deviations from the mean. The percentage swells to 95% as we go out to two standard deviations. Almost all (99.7%) of the students will fall within three standard deviations.

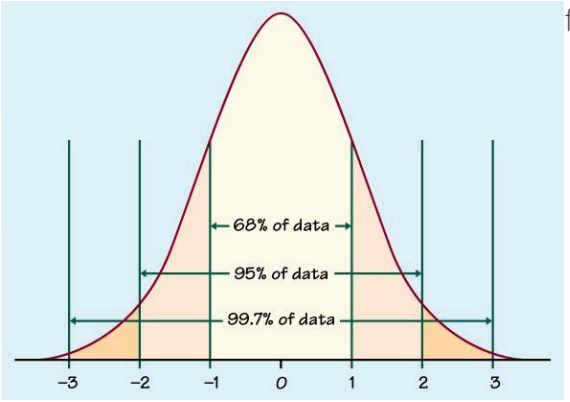



**Figure 5.2.10.** Standard deviation

Source: The Data School; https://www.thedataschool.co.uk/anuka-teggart/tipweek-calculating-z-scores-in-tableau/

## DESCRIBING DISTRIBUTIONS USING MEASURES OF LOCATION AND VARIABILITY

Distributions can be characterized by measures of location and variability. In the following figure, we can see that the treatment group has a *higher* mean compared to the control group. However, their variability is the *same* as depicted by the shape of the graphs.

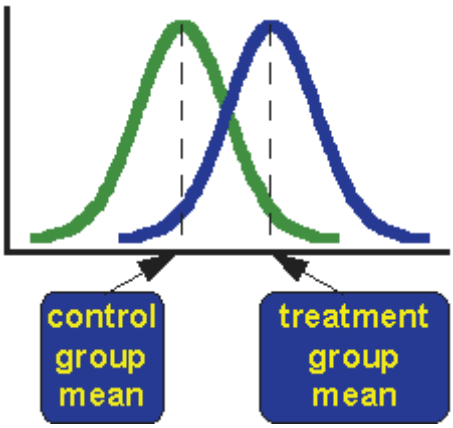



**Figure 5.2.11**. Distribution through measures of location and variability.

**source**: Research Methods Knowledge Base; http://www.socialresearchmethods.net/kb/stat_t.htm

In the following figure, groups A and B have the same means; however, group A is more heterogeneous and group B is more homogeneous. The standard deviation of group A would be *higher* than that of group B.

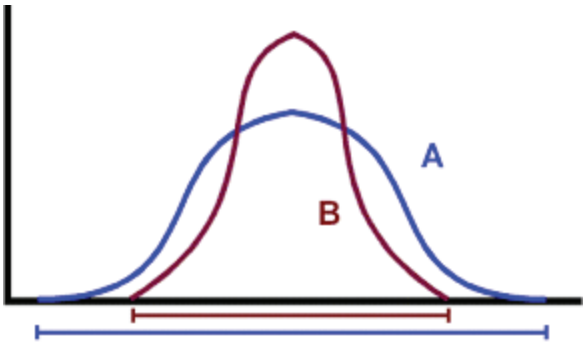



**Figure 5.2.12.** Distribution through measures of location and variability.

**source**: Mark Plonsky, PhD; University of Wisconsisn-Stevens Point; https://www4.uwsp.edu/psych/stat/5/ct-var.htm

## DESCRIBING DATA USING CORRELATION COEFFICIENT

*Correlation Coefficient* is a descriptive statistic used in examining the nature of the *relationship* between variables. The following are the two information that can be

obtained from correlation coefficient.

1. **Numerical value**—This tells the *strength* or *intensity* of the relationship between the variables. The values can range from 0 (no relationship) to 1.0 (perfect relationship). Values in between can be interpreted as weak (0.1 to 0.3), moderate (0.4 to 0.6), and strong (0.7 to 0.9).
2. **Sign**—This indicates the *direction* of the relationship, which can be either positive or negative. *Positive* coefficient indicates *direct* relationship, meaning, as one variable *increases*, the other likewise *increases*, and vice versa. *Negative* coefficient indicates *inverse* relationship; as one variable *increases*, the other one *decreases*.

There are many formulas for computing the correlation coefficient between variables depending on how these are measured. If the two variables are *continuous*, that is, the values range from low to high, say from 50 to 95, the appropriate formula is the *Pearson product-moment correlation coefficient*. However, if the variables are in the form of *ranks*, the suitable formula is the *Spearman's rank-order correlation or Spearman's rho.*

Consider the earlier data on Grade 3 pupils obtained from literacy and numeracy asssessment, n = 10.

| Student ID | Literacy score | Numeracy score | Anxiety level |
|---|---|---|---|
| 1 | 26 | 12 | 7 |
| 2 | 25 | 15 | 7 |
| 3 | 27 | 14 | 7 |
| 4 | 24 | 10 | 9 |
| 5 | 25 | 15 | 5 |
| 6 | 24 | 11 | 8 |
| 7 | 25 | 14 | 8 |
| 8 | 23 | 13 | 6 |
| 9 | 25 | 13 | 7 |
| 10 | 26 | 13 | 6 |

The Pearson product-moment correlation coefficient computed for literacy and numeracy scores is r = +0.35. There is a *direct* but *weak* relationship between the two variables. The correlation coefficient for numeracy score and anxiety level is r = -0.65. There is a *moderate inverse* relationship between numeracy and anxiety.

## COMPUTING DESCRIPTIVE STATISTICS USING MS EXCEL

Basic MS Excel operations can help you find all the descriptive statistics discussed. Using the data on numeracy and literacy scores and anxiety level provided in a table earlier compute all the descriptive statistics using MS Excel. Observe the following steps in using MS Excel in computing descriptive statistics for different sets of data.

1 On your computer, find the icon for MS Excel and click it. You should be able to see a blank worksheet similar to this one.

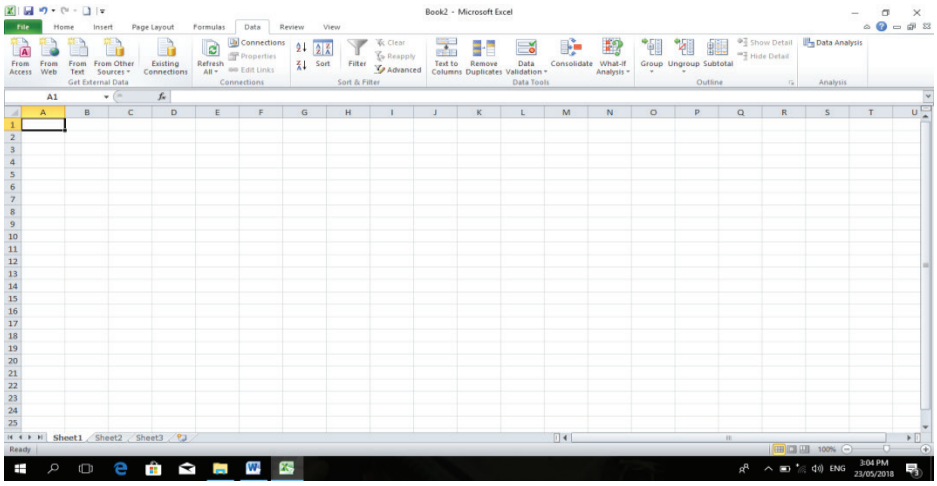


**Figure 5.2.13.** Excel Blank Worksheet.

2. Begin by preparing a coding guide for the data. Be sure to follow the format already presented in previous session guides. The following is also an example.

**Table 5.2.2.** Coding guide for data set for descriptive statistics.

| Column number | Variable* | Variable label* | Value | Value label* | Level of measurement |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

3 Using the coding guide you have prepared, encode the data.

4 To compute for descriptive statistics such as mode, median, mean, range, variance, and standard deviation, open the MS Excel data file you will be analyzing. Use basic MS Excel operations for these statistics.

5 Find a blank space on which you want the statistic to appear. That space should NOT be within the data, but *below* the data set. It is a good idea to write the name of the statistic beside the blank space where you want it to appear.

6 On top of the Excel page, find the function key (*fx)* and click it. A window will open asking you to select a function. Usually, the window will open the "Most Recently Used" functions. Find the statistic you need and click it. Always read the description of the statistic to be sure the function you click is exactly the statistic you desire.

7 If the statistic you need is not in the list, look for it in "All." Once you find the statistic you need, click the "OK" button at the bottom of the window. This will open the "Function Arguments" windows where you have to specify the data set on which the statistic will be computed called "Array." The cursor is always positioned inside the Array1 box. In case it is not, just click the box beside "Array1." Then, go back to the data set and simply drag the cursor from the first data point to the last.

8 You will notice that the result is already indicated on this window. Click the "OK" button to automatically enter the statistic in the blank space.

9 In some statistics, two arrays are needed. For example, you will need to enter *two arrays*, one for each variable, for the function *Pearson*.

10 There is no function for range in basic MS Excel operations, but you can find it by simply getting the highest value (Max) and the lowest value (Min) in the array. You may then simply write the formula on the formula bar, (Max minus Min).

11 To practice using basic MS Excel operations for descriptive statistics, compute the mode, median, mean, range, variance, and standard deviation for all three variables (literacy score, numeracy score, and anxiety level). Find also the correlation coefficient using the function *Pearson*.

12 Display the results of your analyses using the following table. Be sure to enter only up to two (2) decimal points.

**Table 5.2.3.** Descriptive statistics for variables in the study.

| Statistics | Variables | | |
|---|---|---|---|
| | Literacy | Numeracy | Anxiety |
| Mode | | | |
| Median | | | |
| Mean | | | |
| Maximum | | | |
| Minimum | | | |
| Range | | | |
| Variance | | | |
| Standard Deviation | | | |

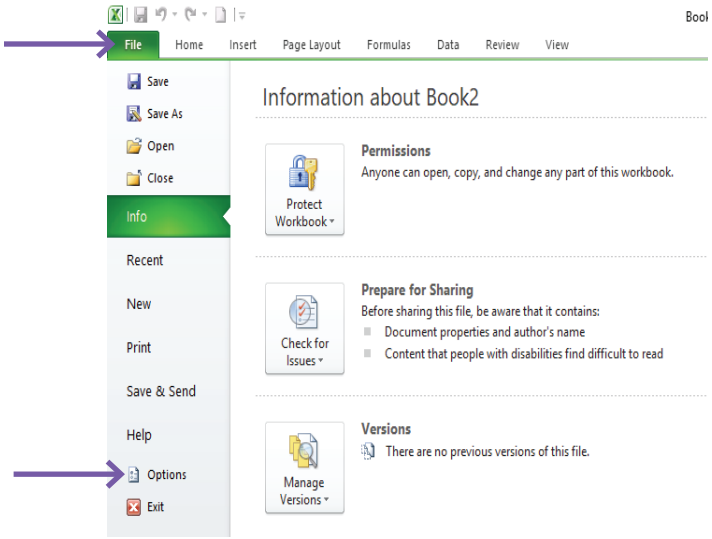
**Table 5.2.4.** Correlation coefficients for variables in the study

| | Numeracy | Anxiety |
|---|---|---|
| **Literacy** | | |
| **Numeracy** | | |

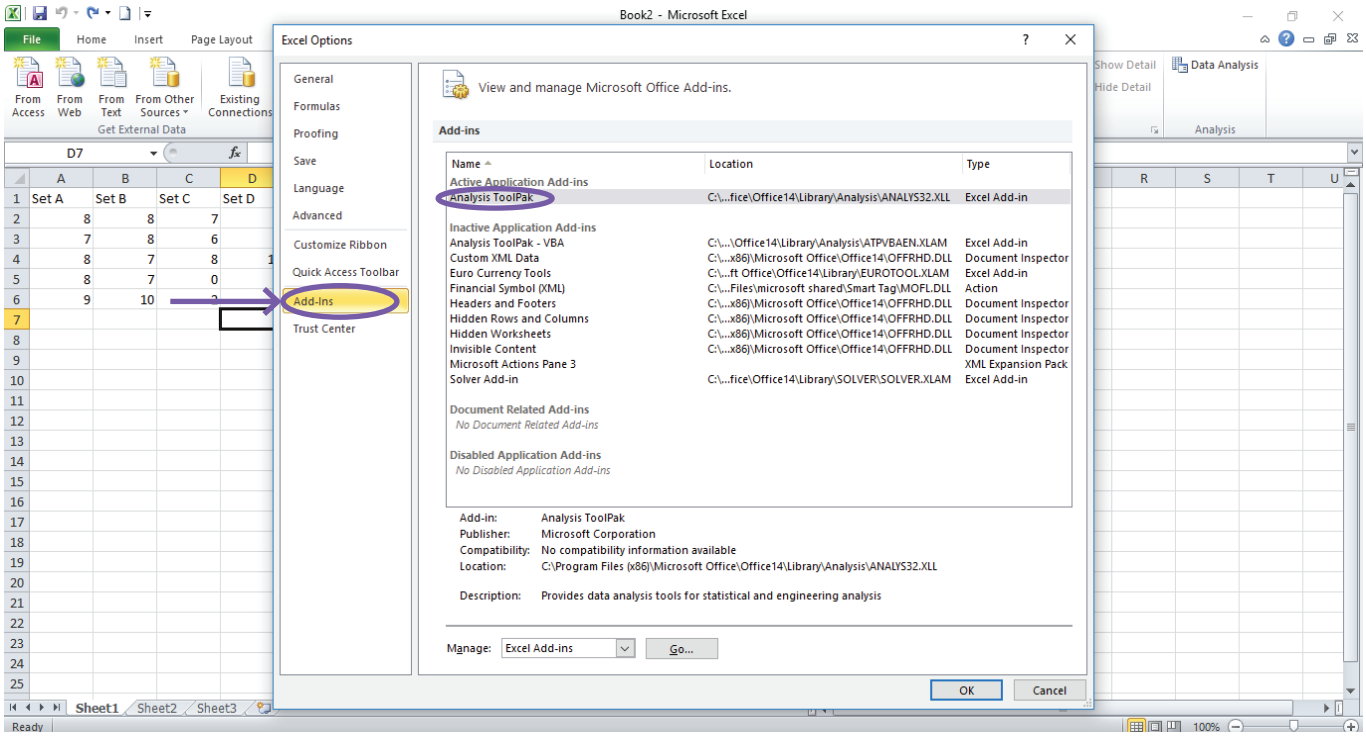
You may check your answers by referring to the table provided at the end of this section.

## ACTIVATING MS EXCEL ADD-INS

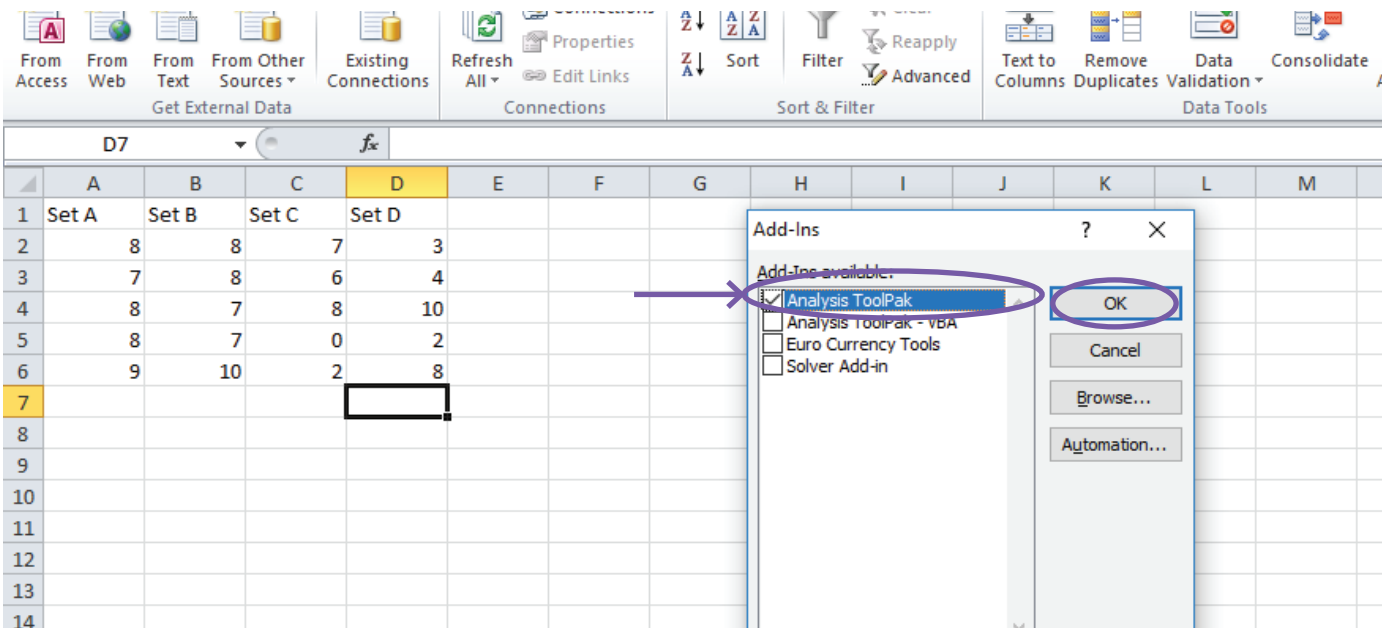
MS Excel Add-ins can help facilitate calculation and display of descriptive statistics. The following are the steps in activating the MS Excel Add-ins



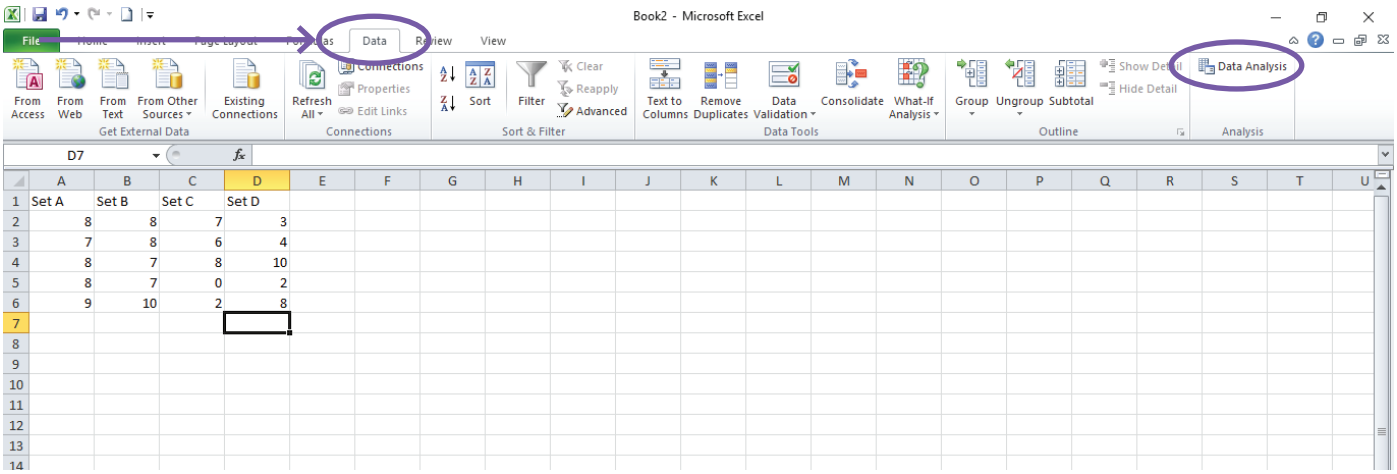
1 Begin by running MS Excel in your computer or laptop.



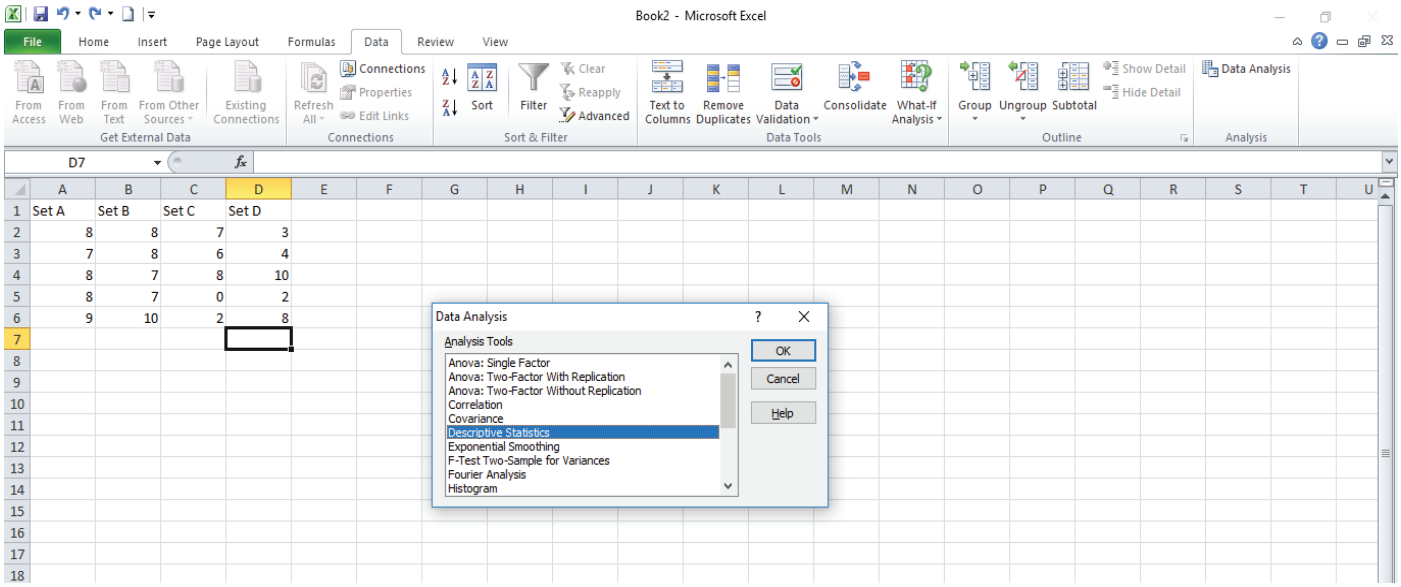

2 Click **File**, then **Options.**



5 Click **Data** on the toolbar, then click **Data Analysis**.




6 Click **Data Analysis.** A pop-up will appear indicating that you are now ready to perform statistical tasks using MS Excel.



7. Double click **Descriptive Statistics**.

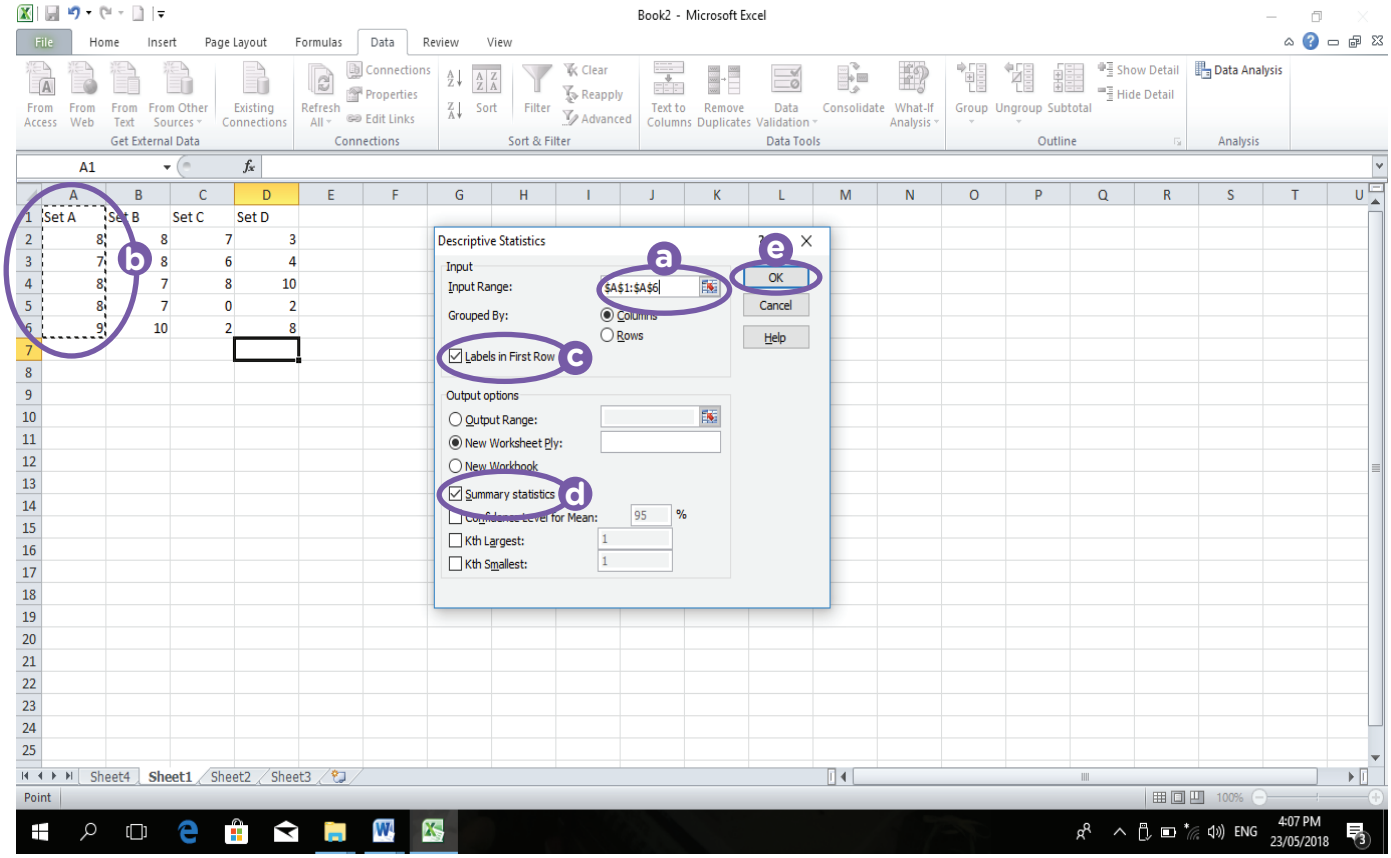
    a. Place the cursor on the **Input Range**.

    b. Highlight the column for SET A in the worksheet.

    c. Check **Labels in first row**.

    d. Check **Summary statistics**.

    e. Click **OK**.




## PRACTICE/EXERCISE

Find a data set and compute the descriptive statistics discussed in this section using basic MS Excel operations and or Analysis ToolPak. Be sure to display the results in tables similar to those shown earlier.

# REFERENCES


Campbell, Michael J, David Machin, and Stephen J. Walters. (1990) 2007. *Medical Statistics: A Commonsense Approach.* Chichester, England: Wiley-Blackwell.

Fraenkel, Jack R. and Norman E. Wallen. (1990) 2008. *How to Design and Evaluate Research in Education.* Boston: McGraw Hill.

Levin, Jack A. James Alan Fox, and David R. Forde. (2003) 2013. *Elementary Statistics in Social Research.* New York: Pearson.

Australian Bureau of Statistics. n.d. "Measures of Shape." Australian Bureau of Statistics (website). Accessed May 21, 2018. http://www.abs.gov.au/websitedbs/a3121120.nsf/home/statistical+language+-+measures+of+shape

Australian Bureau of Statistics. n.d. "Measures of Central Tendency." Australian Bureau of Statistics (website). Accessed May 21, 2018. http://www.abs.gov.au/websitedbs/a3121120.nsf/home/statistical+language+-+measures+of+central+tendency

Center Grove Community School Corporation. n.d. "Module 7: Measures of Central Tendency." Canvas (website). Accessed May 21, 2018. https://centergrove.instructure.com/courses/1823759/pages/module-7-measures-of-central-tendency

Paul Gingrich. n.d. "Association Between Variables." Introductory Statistics for the Social Sciences. University of Regina Department of Sociology and Social Studies (website). Accessed May 21, 2018. http://uregina.ca/~gingrich/ch11a.pdf


# ANSWER KEY

**Table 5.2.3.** Descriptive statistics for variables in the study.

| Statistics | Variables | | |
|---|---|---|---|
| | Literacy | Numeracy | Anxiety |
| Mode | 25.00 | 13.00 | 7.00 |
| Median | 25.00 | 13.00 | 7.00 |
| Mean | 25.00 | 13.00 | 7.00 |
| Maximum | 27.00 | 15.00 | 9.00 |
| Minimum | 23.00 | 10.00 | 5.00 |
| Range | 4.00 | 5.00 | 4.00 |
| Variance | 1.33 | 2.67 | 1.33 |
| Standard Deviation | 1.15 | 1.63 | 1.15 |

**Table 5.2.4.** Correlation coefficients for variables in the study

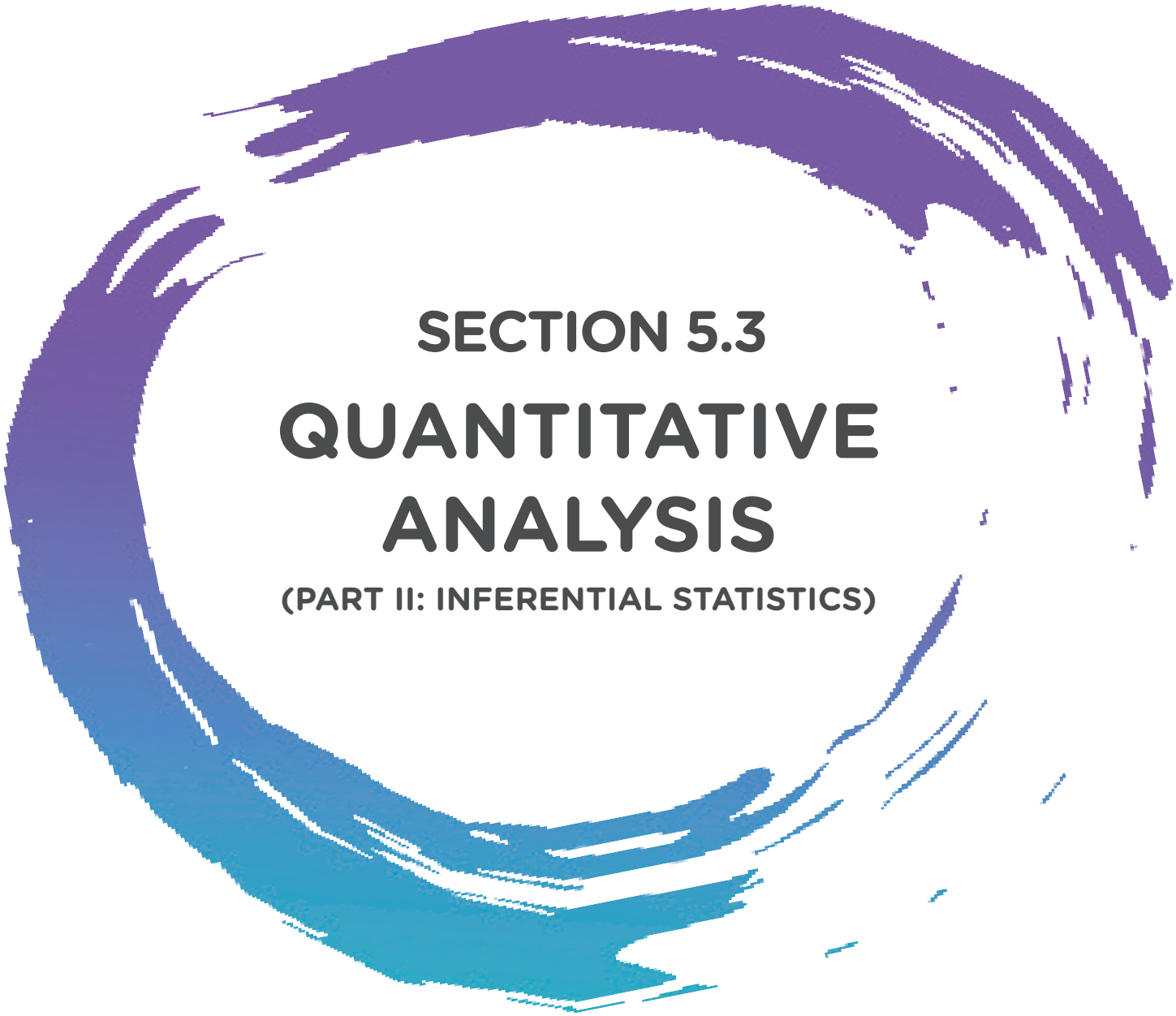
| | Numeracy | Anxiety |
|---|---|---|
| **Literacy** | +0.35 | -0.17 |
| **Numeracy** | | -0.65 |

## NOTES/SIDEBAR

An unbiased estimator is an accurate statistic that is used to approximate a population parameter. In more mathematical terms, an estimator is unbiased if the estimator (e.g., the sample variance $s^2$) is *equal* to the parameter (e.g., the population variance $\sigma^2$). The equation for sample variance as unbiased estimator is as follows:

$$s^2 = \frac{\sum (X - \bar{X})^2}{N - 1}$$

Notice that in the denominator, instead of using n or sample size, n—1, or otherwise known as "degree of freedom" (df) is applied. Dividing the sum of squared deviations by df makes the sample variance an *unbiased estimator* of the population variance.



# SECTION 5.3

# QUANTITATIVE ANALYSIS

## (PART II: INFERENTIAL STATISTICS)

## OBJECTIVES

At the end of this section, the reader will be able to:

1. identify the specific purposes of inferential statistics in data analysis;
2. observe the steps in hypothesis testing;
3. use the appropriate inferential statistics for given research questions and set of data; and
4. conduct hypothesis testing utilizing the data provided.

## INTRODUCTION

The essence of Action Research is for teachers to be able to implement carefully designed interventions as solutions to problems in their classrooms. To assert that the intervention works, it is important to show that the findings are not merely due to *chance.* It is also necessary to prove that if the study were to be repeated, the findings will be the same, within a margin of error.

An improvement in the classroom situation or an increase in achievement scores may indicate that the intervention works, but this may be subjective and due to luck. It will benefit more learners if the intervention is found to be *statistically significant* and not merely due to chance.

The process of finding out whether or not the results obtained from a sample are credible is called *hypothesis testing*. *Inferential statistics* is applied in this process.

When numerical data are collected as evidence for the effectiveness of an intervention in Action Research, it is necessary to engage in hypothesis testing wherein the probability or likelihood that there is no difference between means (null hypothesis) is examined. When the probability or likelihood of the null hypothesis is found to be very remote, we reject it and accept, instead, the research hypothesis, which, in the first, place, is our hypothesis of interest. The process of hypothesis testing is facilitated by computer programs such as MS Excel Add-Ins.

This section will introduce the concepts and processes related to inferential statistics.

## STEPS/KEY CONCEPTS

One cannot categorically conclude that an intervention implemented in an experimental Action Research is effective, even if an examination of test scores or numerical data suggests it. The data have to be subjected to *inferential statistics* in a process called *hypothesis testing*.

Hypothesis testing allows us to *ascertain* if the null hypothesis stands vis-à-vis the research hypothesis given the data collected. It enables us to see if findings from experimental Action Research are merely due to *chance* or are *true* effects of the intervention implemented.

## STEPS IN HYPOTHESIS TESTING

*Hypothesis testing* is the process of making general statements regarding the effectiveness of an intervention or treatment based on data collected from an experimental Action Research. It is a statistical method applied in making decisions about parameters using statistics computed from sample data. It essentially requires appraising the *likelihood* of the *null hypothesis* being *true* based on sample data. The following are the seven (7) basic steps in hypothesis testing.

### 1 Formulate the research question

This initiates the process of hypothesis testing. The research question serves as the basis of hypotheses.

*Example:*
Is there a difference between experimental and control groups in terms of posttest scores?

or

Do experimental and control groups differ with regard to posttest scores?

### 2 State the null hypothesis

The null hypothesis asserts that there is *no difference* between the means (μ) of the two groups. It is set up to be rejected in order for us to accept the research hypothesis, which is the hypothesis we are interested in. This may be written as the following mathematical statement. Note that population parameters (symbolized by "μ") are used.

$$\mu_1 - \mu_2 = 0$$

It may also be written as this *sentence*:

There is no difference between experimental and control groups in terms of posttest scores.

or

Experimental and control groups do not differ with regard to posttest scores.

The following is also another way of stating the null and research hypotheses:

Null Hypothesis ($H_0$):
*The means of experimental and control groups are* equal.

Research Hypothesis ($H_1$ OR $H_A$):
*The means of experimental and control groups are* not equal.

Note the following *mathematical expression* for the above null hypothesis with the research hypothesis.

$$H_0 : \mu_A = \mu_B$$

$$H_1 : \mu_A \neq \mu_B$$

In hypothesis testing, it is the null hypothesis that is tested; its likelihood of being true is examined in view of data collected.

### 3 Specify the level of significance

The *probability* or *likelihood* of the null hypothesis being *true* is set at a minimum. In Social Science, it is at 5 percent or five in a hundred (α = 0.05 or 5%). In medical science, it may be more extreme; sometimes one in a thousand or 0.001 (α = 0.01 or 1%; α = 0.001 or 0.01%). This is also known as *significance level* or *alpha level* (α).

Technically, it is the percentage of *error* we are willing to risk in rejecting the null hypothesis. However, an alpha level of α = 0.05 means that if the study were to be done 100 times, we are willing to be in error in 5% of those (see *Notes/ Sidebar* at the end of this section).

A concept related to level of significance is *level of confidence*. It is simply 1—α. If α = 0.05, then our level of confidence is 0.95 or 95%. This means that we are *95%*

*confident* that whatever conclusion we derive from rejecting the null hypothesis is *correct*.

### 4 Compute the inferential statistic

This refers to the statistical formula used in comparing means. This is done because *populations* are either too large or too indefinite to study. *Sample* (preferably *random*) provides data for testing the null hypothesis. Other inferential statistics that might be useful to you are the *F statistic* (or Analysis of Variance; used for comparing *three* or *more* means) and *Chi Square* (used for comparing *frequencies*) (see *Notes/Sidebar* at the end of this section).

### 5 Compare obtained or computed statistic with the critical value

A *critical value* has been computed for each sample size n and alpha level. It is the *minimum* value of the computed statistic for one to be able to *reject* the null hypothesis. The following table shows the values.

| Two Tailed Significance | | | | | | |
|---|---|---|---|---|---|---|
| *Degrees of freedom (n-1)* | **α = 0.20** | **0.10** | **0.05** | **0.02** | **0.01** | **0.002** |
| | | | | | | |
| 1 | 3.078 | 6.314 | 12.706 | 31.821 | 63.657 | 318.300 |
| 2 | 1.886 | 2.920 | 4.303 | 6.965 | 9.925 | 22.327 |
| 3 | 1.638 | 2.353 | 3.182 | 4.541 | 5.841 | 10.214 |
| 4 | 1.533 | 2.132 | 2.776 | 3.747 | 4.604 | 7.173 |
| 5 | 1.476 | 2.015 | 2.571 | 3.305 | 4.032 | 5.893 |
| | | | | | | |
| 6 | 1.440 | 1.943 | 2.447 | 3.143 | 3.707 | 5.208 |
| 7 | 1.415 | 1.895 | 2.365 | 2.998 | 3.499 | 4.785 |
| 8 | 1.397 | 1.860 | 2.306 | 2.896 | 3.355 | 4.501 |
| 9 | 1.383 | 1.833 | 2.262 | 2.821 | 3.250 | 4.297 |
| 10 | 1.372 | 1.812 | 2.228 | 2.764 | 3.169 | 4.144 |
| | | | | | | |
| 11 | 1.363 | 1.796 | 2.201 | 2.718 | 3.106 | 4.025 |
| 12 | 1.356 | 1.782 | 2.179 | 2.681 | 3.055 | 3.930 |
| 13 | 1.350 | 1.771 | 2.160 | 2.650 | 3.012 | 3.852 |
| 14 | 1.345 | 1.761 | 2.145 | 2.624 | 2.977 | 3.787 |
| 15 | 1.341 | 1.753 | 2.131 | 2.602 | 2.947 | 3.733 |

Another comparison that can be made is with the significance or alpha level **α** and the *probability* (p) *associated* with the *obtained* or *computed t*-value. Many statistical software now give *both* the *t*-value and the *probability* or *p*-value. The rule is that the *p*-value must be *lower* than the alpha level to be able to *reject* the null hypothesis.

### 6 Decide on the null hypothesis

The decision is either to *reject* the null hypothesis or to *fail to reject* it. The null hypothesis is rejected if the following conditions are met:

**a** The *obtained* or *computed inferential statistic* is *greater than* the *critical value*. *Example*: computed *t*-value = 3.57 > critical *t*-value = 2.10

**b** The *p-value* associated with the computed statistic is *less than* the *level of significance*.

*Example*: *p*-value = 0.0002 < alpha level α = 0.05

If the null hypothesis is rejected, the *research hypothesis* is *accepted*.

However, if the computed *t*-value is *less* than the critical value, we *cannot* reject the null. Therefore, we must *retain* it. This does *not* mean though that we are rejecting our research hypothesis. All things are still *tenable* or *plausible* even the research hypothesis. We may have to *redesign* the study, increase sample size, improve sampling and data collection methods, repeat the experiment, and go through hypothesis testing again in order to *possibly accept* our research hypothesis.

### 7 Draw the conclusion

Based on the decision on the null hypothesis, we either conclude that there *is* a difference between the two means (if we *reject* the null hypothesis) or declare that there is *no* difference between them (if we *fail to reject* the null hypothesis). The conclusion is the *answer* to the research question. Rejecting the null hypothesis may imply that the intervention or treatment has been effective according to our prediction.

Recall *nondirectional* and *directional hypotheses* from Section 2.3. The nondirectional research hypothesis that states "There is a difference between two means" does *not specify* which one is *higher* or *lower*. When *accepting* this nondirectional research hypothesis, we must examine which group is *favored* by the results. If the results favor the experimental group that received the intervention, then and only then can we say that the treatment has indeed been *effective*.

## INFERENTIAL STATISTICS FOR COMPARING TWO MEANS

*Inferential statistics*, unlike descriptive statistics, help Action Researchers make general statements concerning the intervention or treatment implemented based on data gathered from a sample. These are used to derive conclusions about the *unknown* characteristics of a population, called *parameters,* from the known characteristics of a sample, called *statistics*. Parameters are symbolized by Greek letters such as μ (pronounced as "myu") and σ (pronounced as "sigma"), while statistics are symbolized by Latin alphabet such as M for mean and S or SD for standard deviation.

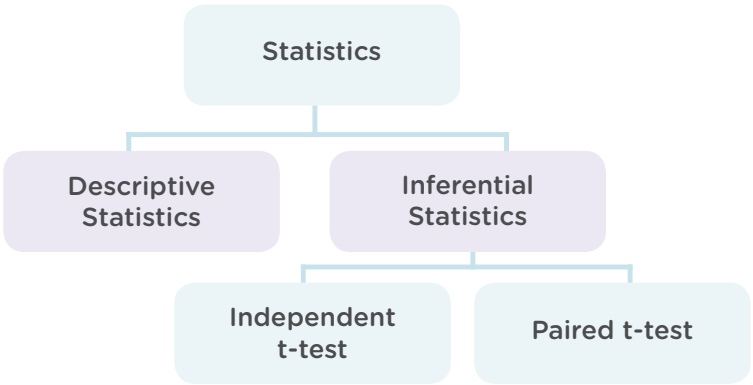
Let us look at the following example of how inferential statistics is used in an Action Research.

To determine the effectiveness of graphic organizers (GOs) in improving comprehension skills, Teacher A conducts an experiment with two groups: one using GOs as an intervention (experimental group) and the other without any intervention at all (control group). He or she gives pretest to both groups at the beginning of the study making sure that the test scores at the start are, on an average, the same for both. Then, he or she administers posttest to both groups at the end of the grading period.

If the mean of the experimental group's posttest scores is *numerically higher* than that of the control group, does this mean that the intervention has been effective? No, the numerical values of mean scores are *not* enough to make categorical statements about the intervention. The means have to be examined and compared using inferential statistics.

We can only say that the intervention has been effective when inferential statistics have ascertained that numerical differences are *statistically significant* or are large enough that they cannot be merely due to chance but are true effects of the intervention. Only then can the teacher conclude that the use of GOs is effective in improving test scores.

Two inferential statistics that may be applied to Action Research are independent *t*-test and the paired *t*-test.




### 1 Independent *t*-test (or independent samples t-test)

This inferential statistic is used for testing the null hypothesis about two groups and comparing means of two groups on the same variable. Since members of the two groups are *not the same*, they are described as "independent" and their means are also "independent." The independent t-test formula is as follows, where the numerator is the difference between the two group means and the denominator requires the variances of the two groups, each divided by its own *sample size*.

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{N_1} + \frac{s_2^2}{N_2}}}$$

*Example*: In comparing the comprehension skills of experimental and control groups after graphic organizers are applied to the experimental group, the independent variable is the use of graphic organizers and the dependent variable is the comprehension skills. *Statistically significant* t-value means there is a *true* difference between the two groups. The findings from the samples can be *generalized* to the *populations* where two groups were drawn.

## 2 Paired or correlated *t*-test

This inferential statistic is used for comparing two means obtained from the same group. The formula for p*aired t-test* or *correlated t-test* is shown below where "*d*" refers to the difference between the paired values (e.g., pretest and posttest scores), which are then summed (Σ). The denominator is the square root of an expression. It might look repetitive, but if you notice, the first part has sample size n multiplied by the sum of all *d* values *squared*, from which the *square* of the *sum* of all *d* values is subtracted. The difference between the two terms is divided by n—1 or the *degree of freedom* (df).

$$t = \frac{\Sigma d}{\sqrt{\frac{n\left(\Sigma d^2\right) - \left(\Sigma d\right)^2}{n-1}}}$$

*Example*: You are comparing pretest and posttest scores on comprehension skills of experimental groups. The following schedule for an experimental Action Research with pretest and posttest is used:

| **First grading period** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Wk 1 | Wk 2 | Wk 3 | Wk 4 | Wk 5 | Wk 6 | Wk 7 | Wk 8 | Wk 9 | Wk 10 |
| Pretest | Manipulative Exercises | | | | | | | | Posttest |

Results of pretest and posttest are subjected to paired *t*-test or correlated *t*-test. *Statistical significance* for the *t*-value indicates there is a *true* difference between the two measures. The conclusions can then be *generalized* to similar measures in the population where the groups were taken.

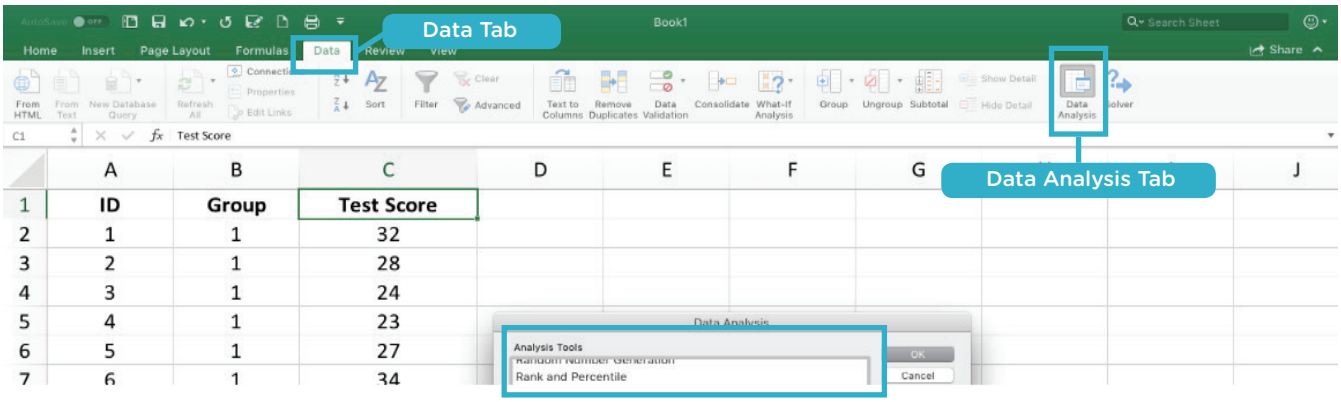
Another situation wherein paired or correlated test may be used is when comparing "related" samples such as siblings and parent-child.

Other inferential statistics are *analysis of variance* (ANOVA) or *F-test* for comparing three or more means and *Chi Square* for examining *frequencies*. Take time to read about them in the statistical reference materials given.

## COMPUTING *t*-TEST USING MS EXCEL ADD-INS

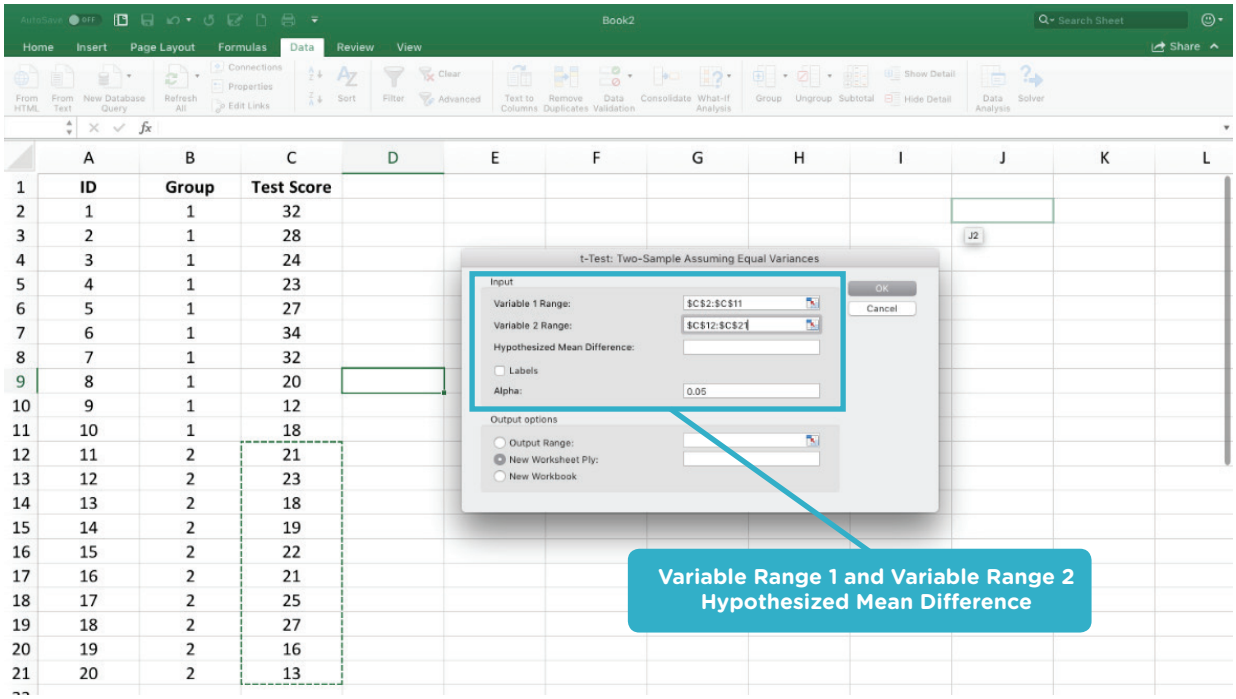
The following illustration of data analysis uses the MS Excel Add-ins. If you wish to follow the steps on your computer, make sure that you have activated the Add-ins. The data used for this illustration are provided at the end of this section (test scores). If you wish to try the steps as we go along, encode first the data on a MS Excel spreadsheet. Follow the coding guide also provided at the end of this section.

1. Get started with the analysis by clicking **Data** on the top of the page, then choose **Data Analysis** tab. A window listing the various statistical tests that MS Excel can perform will open. Simply scroll down to find the *t*-test option and click **OK**.



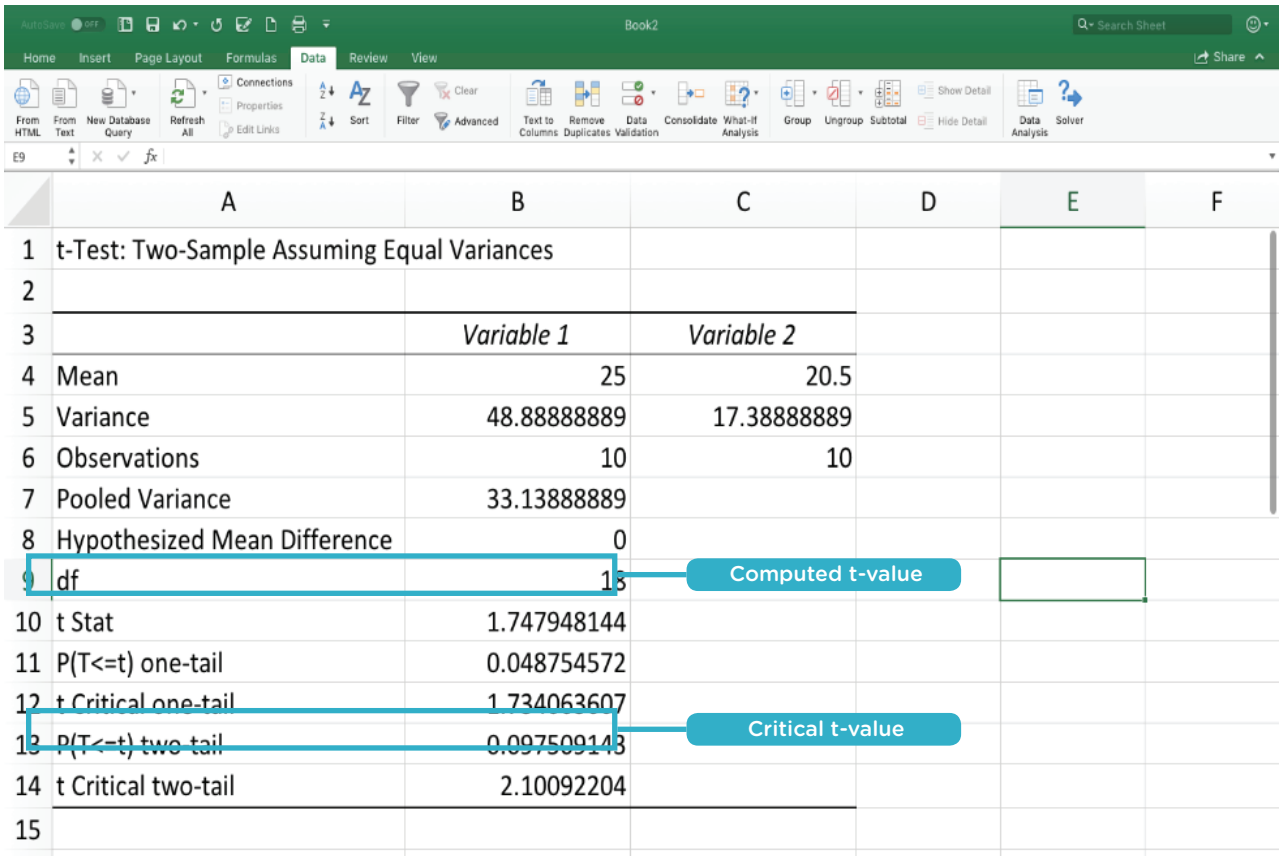

2. Define the data that will be analyzed. In the menu box, click in the **Variable 1 Range** box, then use the cursor to select the column containing the data for "Test Score" for the boys, labelled as "1" under the column for "Group." As the cells are selected in the spreadsheet, the range also appears in the menu box window. Repeat the process for "Variable 2 Range," but this time, select the cells under "Test Score" that correspond to "2" under the column for "Group."

3. For the hypothesized mean difference, simply put zero (0). Change the output options. For the value of alpha, just keep it at the default alpha of 0.05, which is the conventional value for research in education and social sciences.




| | A | B | C |
|---|---|---|---|
| 1 | ID | Group | Test Score |
| 2 | 1 | 1 | 32 |
| 3 | 2 | 1 | 28 |
| 4 | 3 | 1 | 24 |
| 5 | 4 | 1 | 23 |
| 6 | 5 | 1 | 27 |
| 7 | 6 | 1 | 34 |
| 8 | 7 | 1 | 32 |
| 9 | 8 | 1 | 20 |
| 10 | 9 | 1 | 12 |
| 11 | 10 | 1 | 18 |
| 12 | 11 | 2 | 21 |
| 13 | 12 | 2 | 23 |
| 14 | 13 | 2 | 18 |
| 15 | 14 | 2 | 19 |
| 16 | 15 | 2 | 22 |
| 17 | 16 | 2 | 21 |
| 18 | 17 | 2 | 25 |
| 19 | 18 | 2 | 27 |
| 20 | 19 | 2 | 16 |
| 21 | 20 | 2 | 13 |

4 After the values needed for the computation of the *t*-statistic have been specified, click **OK**. We can now see the results of the statistical test. Unless we select otherwise, the results, by default, will open in a new worksheet.




| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | t-Test: Two-Sample Assuming Equal Variances | | | | | |
| 2 | | | | | | |
| 3 | | *Variable 1* | *Variable 2* | | | |
| 4 | Mean | 25 | 20.5 | | | |
| 5 | Variance | 48.88888889 | 17.38888889 | | | |
| 6 | Observations | 10 | 10 | | | |
| 7 | Pooled Variance | 33.13888889 | | | | |
| 8 | Hypothesized Mean Difference | 0 | | | | |
| 9 | df | 18 | | | | |
| 10 | t Stat | 1.747948144 | | | | |
| 11 | P(T<=t) one-tail | 0.048754572 | | | | |
| 12 | t Critical one-tail | 1.734063607 | | | | |
| 13 | P(T<=t) two-tail | 0.097509143 | | | | |
| 14 | t Critical two-tail | 2.10092204 | | | | |
| 15 | | | | | | |

The following are the steps for the hypothesis testing done on the boys' and girls' test scores data.

1 Formulate the research question.

> "Is there a difference between boys and girls in terms of scores on the manipulative test?"
>
> or
>
> "Do boys and girls differ with regard to scores on the manipulative test?"

2 State the null hypothesis and its alternative.

> *Null Hypothesis* ($H_0$): There is no difference between boys and girls in terms of scores on the manipulative test.
>
> *Research Hypothesis* ($H_1$ *or* $H_A$): There is a difference between boys and girls in terms of scores on the manipulative test.
>
> or
>
> *Null Hypothesis* ($H_0$)*:* Boys and girls do not differ with regard to scores on the manipulative test.
>
> *Research Hypothesis* ($H_1$ *or* $H_A$)*:* Boys and girls do differ with regard to scores on the manipulative test.

3 Specify the level of significance.

> alpha = 0.05; Using this significance level and degree of freedom *df* = 18, the critical *t*-value is *t* = 2.10.

4 Compute the inferential statistic.

Compute the descriptive statistics first. You may use basic MS Excel operations to accomplish this. The following table shows the descriptive statistics for the data.

| STATISTICS | GENDER GROUPS | |
|---|---|---|
| | Boys (n = 10) | Girls (n = 10) |
| Mode | 32.00 | 21.00 |
| Median | 25.50 | 21.00 |
| Mean | 25.00 | 20.50 |
| Maximum | 34.00 | 27.00 |
| Minimum | 12.00 | 13.00 |
| Range | 22.00 | 14.00 |
| Variance | 48.89 | 17.39 |
| Standard deviation | 6.99 | 4.17 |

With the use of MS Excel Add-ins, the results may be displayed in a table such as the following one.

| Group | Mean | SD | *t*-computed | *t*-critical | *p*-value |
|---|---|---|---|---|---|
| Boys | 25.00 | 6.99 | 1.75 | 2.10 | 0.10 |
| Girls | 20.50 | 4.17 | | | |

5 Compare the obtained or computed statistic with the critical value (or the *p*-value associated with the obtained *t*-value and the alpha level).

| Critical value approach | *p*-value approach |
|---|---|
| REJECT THE NULL HYPOTHESIS IF the computed value is *greater than* the critical value. | REJECT THE NULL HYPOTHESIS IF the *p*-value is *less than* the alpha which is 0.05, |
| *t* computed = 1.75 < t critical = 2.10 | *p* value = 0.10 > Alpha = 0.05 |

6 Decide on the null hypothesis.

*Using the critical value approach:*

Since the computed *t*-value is less than the critical *t*-value, we *fail* to reject the null hypothesis.

*Using the p-value approach:*

Since the *p*-value is greater than the alpha, we *fail* to reject the null hypothesis.

7 Draw the conclusion.

> There is *no* difference between boys and girls in terms of scores on the Manipulative test.
>
> or
>
> Boys and girls do *not* differ with regard to scores on the manipulative test.

If the computed or obtained *t*-value happens to be *greater* than the critical *t*-value or the *p*-value associated with the computed or obtained *t*-value is *less* than our alpha level of 0.05, the conclusion will be:

> There is a difference between boys and girls and boys do better than girls in the manipulative test.

## PRACTICE/EXERCISE

The following are pretest and posttest Math scores of boys (n = 12) and girls (n = 12) in a special class where gamification (use of games) was applied as an instructional strategy.

| ID | Boys (n = 12) | | ID | Girls (n = 12) | |
|---|---|---|---|---|---|
| | Pretest | Posttest | | Pretest | Posttest |
| B1 | 8 | 15 | G1 | 9 | 6 |
| B2 | 5 | 12 | G2 | 7 | 7 |
| B3 | 7 | 16 | G3 | 8 | 4 |
| B4 | 4 | 10 | G4 | 6 | 5 |
| B5 | 10 | 18 | G5 | 11 | 6 |
| B6 | 7 | 15 | G6 | 8 | 8 |
| B7 | 4 | 9 | G7 | 9 | 4 |
| B8 | 7 | 14 | G8 | 10 | 8 |
| B9 | 10 | 15 | G9 | 8 | 5 |
| B10 | 7 | 13 | G10 | 7 | 6 |
| B11 | 9 | 15 | G11 | 5 | 7 |
| B12 | 6 | 11 | G12 | 8 | 6 |

Using what you have learned about computing for inferential statistics, do the following task with the data set provided.

1. Test the following null hypotheses: (a) There is no difference in the posttest scores of boys and girls; (b) There is no difference in the pretest and posttest scores of boys; and (c) There is no difference in the pretest and posttest scores of girls.
2. Prepare a coding guide for the data and encode accordingly. Follow the format discussed previously.
3. Compute descriptive statistics such as mode, median, mean, maximum, minimum, range, variance, and standard deviation.
4. Follow the steps of hypothesis testing. To facilitate computation, use MS Excel Add-ins to facilitate computation.
5. Use nondirectional hypotheses and the conventional $\alpha = 0.05$.

You may check your output by referring to the answer key provided at the end of this section. It will benefit you most if you refer to the answer key *after* you have completed the exercise.

## REFERENCES


Fraenkel, Jack R. and Norman E. Wallen. (1990) 2008. *How to Design and Evaluate Research in Education*. Boston: McGraw Hill.

Levin, Jack A., James Allan Fox, and David R. Forde. (2003) 2013. *Elementary Statistics in Social Research*. New York: Pearson.

Shafer, Douglas S. and Zhiyi Zhang. 2013. *Introductory Statistics.* Flat World Knowledge. Accessed May 2018. https://www.saylor.org/site/textbooks/Introductory%20Statistics.pdf.


## NOTES/SIDEBAR

### KEY TERMS AND CONCEPTS IN HYPOTHESIS TESTING

1. **Null hypothesis.** Null hypothesis is a statistical hypothesis that assumes that the observation is due to a chance factor. It is denoted by $H_0$: $\mu 1 = \mu 2$, which shows that there is no difference between the two population means.
2. **Alternative hypothesis.** Contrary to the null hypothesis, the alternative hypothesis shows that the observations are the result of a real effect.
3. **Level of significance.** This refers to the degree of significance in which we accept or reject the null-hypothesis. A hundred percent accuracy is not

possible for accepting or rejecting a hypothesis, so we therefore select a level of significance that is usually at 5%.

4 **Type I error.** This is when we reject the null hypothesis, although it is true. Type I error is denoted by alpha. In hypothesis testing, the normal curve that shows the critical region is called the alpha region.

5 **Type II errors.** This is when we accept the null hypothesis, even though it is false. Type II errors are denoted by beta. In hypothesis testing, the normal curve that shows the acceptance region is called the beta region.

6 **Power.** It is usually known as the probability of correctly accepting the null hypothesis. 1-beta is called power of the analysis.

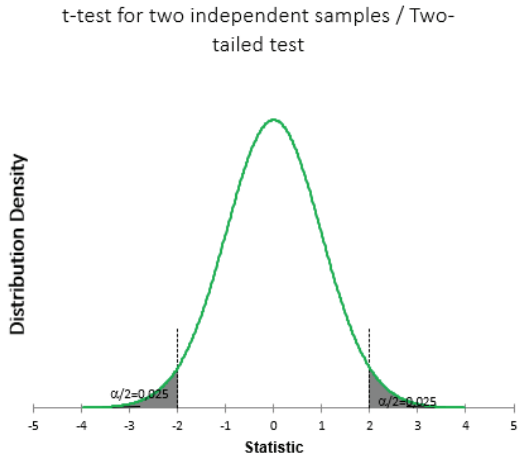
7 **One-tailed test.** This is when the given statistical hypothesis is one value like $H_0$: μ1 = μ2.

8 **Two-tailed test.** This is when the given statistic hypothesis assumes a less than or greater than value.

**source**: Statistics Solution; http://www.statisticssolutions.com/hypothesis-testing/

## WHAT IS THE DIFFERENCE BETWEEN A TWO-TAILED AND A ONE-TAILED TEST?

Inferential statistics are used to test hypotheses, so they are also called statistical tests. These imply that the calculation of a specific number is called a *statistic*. This number has a *theoretical distribution* under the null hypothesis. The specific statistic in comparing two means is the *t*-statistic. This has a bell-shaped distribution in many cases (depending on the sample size and the level of significance) similar to the normal distribution as shown in the following image.




The two extremes of the distribution (shaded areas) are the *tails*. There is a *positive* tail (right side) and a *negative* tail (left side). Each shaded area is sometimes referred to as the *region of rejection,* so that if a computed or obtained *t*-value lies *inside* the

region of rejection, the null hypothesis is rejected. The *area* of each region of rejection is α/2 or half of the level of significance α. In other words, the *total* area for the region of rejection is 0.05, our conventional level of significance or alpha level α. However, because we have two tails, the alpha value is halved.

Notice also the imaginary vertical line that "cuts off" each region of rejection. The *point* on the X-axis that the vertical line touches is the *critical value* of the *t*-statistic. If the critical value is on the *right*, it is *positive*; if it is on the *left*, it is *negative*.

A statistical test like the t-test is based on the two competing hypotheses: **the null hypothesis $H_0$ and the research hypothesis $H_a$**.

Recall that there are nondirectional and directional pairs of null and research hypotheses.

### 1 Nondirectional hypotheses

$H_0$: There is no difference between the means of groups 1 and 2.
$(\mu_1 - \mu_2 = 0)$
$H_a$: There is a difference between the means of groups 1 and 2.
$(\mu_1 - \mu_2 \neq 0)$

Another way of stating this pair is:
$H_0$: The mean of group 1 is equal to the mean of group2.
$(\mu_1 = \mu_2)$
$H_a$: The mean of group 1 is not equal to the mean of group2.
$(\mu_1 \neq \mu_2)$

### 2 Directional hypotheses

$H_0$: The difference between the means of groups 1 and 2 is less than or equal to zero.
$(\mu_1 - \mu_2 \leq 0)$

$H_a$: The difference between the means of groups 1 and 2 is greater than zero.
$(\mu_1 - \mu_2 > 0)$

Another way of stating this pair is:
$H_0$: The mean of group 1 is either less than or equal to the mean of group 2.
$(\mu_1 \leq \mu_2)$
$H_a$: The mean of group 1 is greater than the mean of group 2.
$(\mu_1 > \mu_2)$

The research hypotheses that the researcher decides to use in the study determines if the t-test is *one-tailed or two-tailed*. Before gathering the data, and we do not know whether the computed statistic will be at the right tail or at the left tail under the alternative hypothesis, the pair of nondirectional hypotheses is favored.

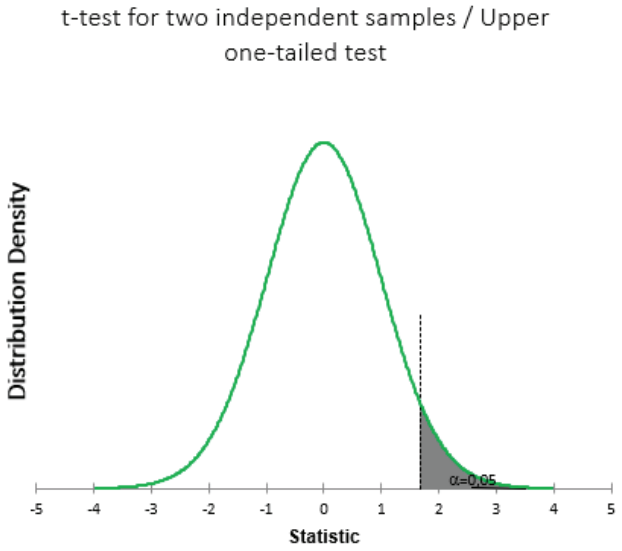
The nondirectional research hypothesis states that there is *a difference* between the two population means. This means that either the population mean of group 1 is greater than that of group 2 or, the opposite, the population mean of group 1 is less than that of group 2.

If the population mean of group 1 is greater than that of group 2, the difference between the two population means ($\mu_1 - \mu_2$) is *positive* or greater than zero.

If it is the opposite or if the population mean of group 1 is less than that of group 2, the difference between the two population means ($\mu_1 - \mu_2$) is *negative* or less than zero.

Therefore, the *t*-value for a nondirectional research hypothesis, the can either be positive or negative. If the *t*-value is positive, it will be on the *right tail* of the *t*-distribution; if the *t*-value is negative, it will be on the *left tail* of the distribution. Thus, the *two-tailed t-test* is applied for nondirectional hypotheses.

For directional research hypothesis ($\mu_1 > \mu_2$) though, the expected difference is positive. Therefore, the focus will be on only one tail, the positive tail, which is on the right. Thus, the statistic applied is the *one-tailed t-test*. Notice now that the area of the region of rejection (shaded area) is $\alpha = 0.05$, which means that in a directional hypothesis, the region of rejection is only on *one* side or on one tail; either the right or the left or either the positive or the negative.



Two-tailed and one-tailed *t*-test refer only to which critical value of the *t*-statistic should be used, as shown in the table below. A critical value of 2.179 for *df* = 12 for a two-tailed test at alpha = 0.05 is also the critical value for a one-tailed *t*-test at alpha = 0.025.

**Critical Values for One-sided and Two-sided Tests Using Student's t Distribution**

| 1 tail: | 0.25 | 0.1 | 0.05 | 0.025 | 0.01 | 0.005 | 0.001 |
|---|---|---|---|---|---|---|---|
| 2 tail: | 0.5 | 0.2 | 0.1 | 0.05 | 0.02 | 0.01 | 0.002 |
| 1 | 1.000 | 3.078 | 6.314 | 12.706 | 31.821 | 63.657 | 318.309 |
| 2 | 0.816 | 1.886 | 2.920 | 4.303 | 6.965 | 9.925 | 22.327 |
| 3 | 0.765 | 1.638 | 2.353 | 3.182 | 4.541 | 5.841 | 10.215 |
| 4 | 0.741 | 1.533 | 2.132 | 2.776 | 3.747 | 4.604 | 7.173 |
| 5 | 0.727 | 1.476 | 2.015 | 2.571 | 3.365 | 4.032 | 5.893 |
| 6 | 0.718 | 1.440 | 1.943 | 2.447 | 3.143 | 3.707 | 5.208 |
| 7 | 0.711 | 1.415 | 1.895 | 2.365 | 2.998 | 3.499 | 4.785 |
| 8 | 0.706 | 1.397 | 1.860 | 2.306 | 2.896 | 3.355 | 4.501 |
| 9 | 0.703 | 1.383 | 1.833 | 2.262 | 2.821 | 3.250 | 4.297 |
| 10 | 0.700 | 1.372 | 1.812 | 2.228 | 2.764 | 3.169 | 4.144 |
| 11 | 0.697 | 1.363 | 1.796 | 2.201 | 2.718 | 3.106 | 4.025 |
| 12 | 0.695 | 1.356 | 1.782 | 2.179 | 2.681 | 3.055 | 3.930 |

Recall that there are two approaches in deciding whether to reject the null hypothesis or not: (1) by comparing the computed or obtained *t*-value with the critical value of the statistic or (2) by comparing the probability *p* associated with the computed or obtained *t*-value with the alpha level. The foregoing explained the first approach.

| Critical value approach | *p*-value approach |
|---|---|
| REJECT THE NULL HYPOTHESIS IF the computed value is *greater than* the critical value. | REJECT THE NULL HYPOTHESIS IF the *p*-value is *less than* the alpha which is 0.05. |

As for the second approach where the *p*-value is used, one will have to rely on computer analysis. As mentioned, most computer software for data analysis will not only yield the computed statistic but also the probability p associated with it. Consider the *p*-value as the *area* of the distribution much like the alpha as shown in the figures above. The logic is quite simple: the *further* the computed statistic is from the center of the distribution, the *closer* it is to the *tail*. This means that the data collected is *more* extreme than the *hypothetical* data generated under the null hypothesis. Thus, as the computed *t*-value increases on either side of the distribution, positive if to the right and negative if to the left, the *p*-value becomes *smaller* and smaller since the tails are

*shrinking* in size as they move away from the center. Higher computed *t*-values will thus go with *smaller p*-values for any given sample size n.

**Source**: XLSTAT**;** https://help.xlstat.com/customer/en/portal/articles/2062454-what-is-the-difference -between-a-two-tailed-and-a-one-tailed-test-

## TYPE I AND TYPE II ERRORS IN DECIDING ABOUT THE NULL HYPOTHESIS

The following figure shows the two types of errors that can be made when we make decisions about the null hypothesis based on our findings. On the right side is the truth which means the null hypothesis is either true or false. On the left side is findings, which lead us to decide that the null hypothesis is indeed true or false.

| | | Truth | |
|---|---|---|---|
| | | $H_o$ True | $H_o$ False |
| Your Findings | $H_o$ True | Correct | Type II Error (β) |
| | $H_o$ False | Type I Error (α) | Correct |

**source:** Epiville, Columbia University; http://epiville.ccnmtl.columbia.edu/popup/power_and_sample_size_introduction.html

If in case the null hypothesis is true and we affirm that it is true based on our findings, then we have made a correct decision. If, however, the null is true and yet we decide that it is false based on our data, then we have committed an error, a type I error. This means that the null is *not true* or that it is *false*, when it is *true***.** It is *rejecting a null hypothesis* when we should have *accepted it.* It is stating that there is a *difference* between means when there is *none.* It is declaring that the means are *not equal* when they *are*. It is pronouncing that the intervention *works* when the truth is it does *not*.

If the null hypothesis is *false* and we conclude that it is *true* in view of data we collected, then we have committed another error, a type II error. However, if the null is *false* and we assert that it is indeed *false*, then we have made a *correct* decision. Type II error, then, is saying that the null is *true* when it is *false*. It is *accepting a null hypothesis* when we should have *rejected it.* It is maintaining that there is *no difference* between means when there is *a difference*. It is affirming that the means are *equal* when they *are not*. It is pointing out that the treatment is *not* effective when it *is*.

Hence, in conducting hypothesis testing, we could be committing an error, either type I or type II error. Between the two types of errors, the more serious one is type I. That is because if we say that an intervention works, many teachers might follow and implement only to find out that it does not.

However, if we say that the treatment is not effective, everything remains. The only negative aspect of this is that those who would have benefited from the intervention did not. Hopefully, it is not a life-threatening effect.

Because the consequences of *rejecting a true null* (type I error) are more serious than those of *accepting a false null* (type II error), we set the limit for type I error to a minimum. This is our alpha or level of significance (α). Type II error is beta (β).

## OTHER USEFUL INFERENTIAL STATISTICS

1. **One Way Analysis of Variance (ANOVA)**—for comparing three or more means
2. **Chi-square**—for comparing frequencies from different groups

## CODING GUIDE FOR DEMONSTRATION DATA ON TEST SCORES

### Coding Guide for Data Set for Descriptive Statistics

| Column Number | Variable* | Variable Label* | Value | Value Label | Level of Measurement |
|---|---|---|---|---|---|
| 1 | ID | ID number | as is | | nominal |
| 2 | gender | gender | 1 | boy | nominal |
| | | | 2 | girl | |
| 3 | score | test score | as is | | ratio |

| ID | Boys' scores |
|---|---|
| B1 | 32 |
| B2 | 28 |
| B3 | 24 |
| B4 | 23 |
| B5 | 27 |
| B6 | 34 |
| B7 | 32 |
| B8 | 20 |
| B9 | 12 |
| B10 | 18 |

| ID | Girls' scores |
|---|---|
| G1 | 21 |
| G2 | 23 |
| G3 | 18 |
| G4 | 19 |
| G5 | 22 |
| G6 | 21 |
| G7 | 25 |
| G8 | 27 |
| G9 | 16 |
| G10 | 13 |

# ANSWER KEY

## PRACTICE/EXERCISE

### Coding Guide for Data Set for Descriptive Statistics

| Column Number | Variable* | Variable Label* | Value | Value Label | Level of Measurement |
|---|---|---|---|---|---|
| 1 | ID | ID number | as is | | nominal |
| 2 | gender | gender | 1 | boy | nominal |
| | | | 2 | girl | |
| 3 | pretest | pretest score | as is | | ratio |
| 4 | posttest | posttest score | as is | | ratio |

## HYPOTHESIS TESTING

### 1 Research Question

- Is there a difference between the boys and the girls in terms of thei Math posttest scores?
- Is there a difference between the Math pretest and posttest scores of the boys?
- Is there a difference between the Math pretest and posttest scores of the girls?

or

- Do the boys and the girls differ with regard to their Math posttest scores?
- Do the Math pretest and posttest scores of the boys differ?
- Do the Math pretest and posttest scores of the girls differ?

### 2 Null and Research Hypotheses

Boys vs. girls on posttest scores

- *Null Hypothesis* ($H_0$): There is no difference between the boys and the girls in terms of Math posttest scores.
- *Research Hypothesis* ($H_1$ or $H_A$): There is a difference between the boys and the girls in terms of Math posttest scores.

Pretest and posttest scores of boys

- *Null Hypothesis* ($H_0$): There is no difference between the Math pretest and posttest scores of the boys.

- *Research Hypothesis* ($H_1$ or $H_A$): There is a difference between the Math pretest and posttest scores of the boys.

Pretest and posttest scores of girls

- *Null Hypothesis* ($H_0$): There is no difference between the Math pretest and posttest scores of the girls.
- *Research Hypothesis* ($H_1$ or $H_A$): There is a difference between the Math pretest and posttest scores of the girls.

or

Boys vs. girls on posttest scores

- *Null Hypothesis* ($H_0$): The boys and the girls do not differ with regard to Math posttest scores.
- *Research Hypothesis* ($H_1$ or $H_A$): The boys and the girls do differ with regard to Math posttest scores.

Pretest and posttest scores of boys

- *Null Hypothesis* ($H_0$): The Math pretest and posttest scores of the boys do not differ.
- *Research Hypothesis* ($H_1$ or $H_A$): The Math pretest and posttest scores of the boys do differ.

Pretest and posttest scores of girls

- *Null Hypothesis* ($H_0$): The Math pretest and posttest scores of the girls do not differ.
- *Research Hypothesis* ($H_1$ or $H_A$): Math pretest and posttest scores of the girls do differ.

## 3 Level of Significance

alpha = 0.05; using this significance level for all hypotheses:

for boys and girls on Math posttest scores

df = 22, critical *t* = 2.10

for Math pretest and posttest scores of boys

df = 11, critical *t* = 2.10

for Math pretest and posttest scores of girls

df = 11, critical *t* = 2.10

**4** Inferential Statistics

Descriptive Statistics

| STATISTICS | BOYS | | GIRLS | |
|---|---|---|---|---|
| | Pretest | Posttest | Pretest | Posttest |
| Mode | 7.00 | 15.00 | 8.00 | 6.00 |
| Median | 7.00 | 14.50 | 8.00 | 6.00 |
| Mean | 7.00 | 13.58 | 8.00 | 6.00 |
| Max | 10.00 | 18.00 | 11.00 | 8.00 |
| Min | 4.00 | 9.00 | 5.00 | 4.00 |
| Range | 6.00 | 9.00 | 6.00 | 4.00 |
| Variance | 4.18 | 6.99 | 2.73 | 1.82 |
| Standard deviation | 2.04 | 2.64 | 1.65 | 1.35 |

With the use of MS Excel Add-ins, the results may be displayed in a table such as the following one.

| Group | Mean | SD | *t*-computed | *t*-critical | *p*-value |
|---|---|---|---|---|---|
| Boys | 13.58 | 2.64 | | | |
| Girls | 6.00 | 1.35 | | | |

Results of *t*-test Comparing Math Pretest and Posttest Scores of Boys

| Group | Mean | SD | *t*-computed | *t*-critical | *p*-value |
|---|---|---|---|---|---|
| Pretest | 7.00 | 2.04 | | | |
| Posttest | 13.58 | 2.64 | | | |

Results of *t*-test Comparing Math Pretest and Posttest Scores of Girls

| Group | Mean | SD | *t*-computed | *t*-critical | *p*-value |
|---|---|---|---|---|---|
| Pretest | 8.00 | 1.65 | | | |
| Posttest | 6.00 | 1.35 | | | |

**5** Compare the obtained or computed statistic with the critical value (or the *p* associated with the obtained *t*-value and the alpha level)

| Critical value approach | *p*-value approach |
|---|---|
| For boys vs. girls on Math posttest<br>*t*-computed = _____ *t* critical = 2.10 | For boys vs. girls on Math posttest<br>*p*-value = _____ alpha = 0.05 |
| For Math pretest and posttest of boys<br>*t*-computed = _____ *t* critical = 2.10 | For Math pretest and posttest of boys<br>*p*-value = _____ alpha = 0.05 |
| For Math pretest and posttest of girls<br>*t*-computed = _____ *t* critical = 2.10 | For Math pretest and posttest of girls<br>*p*-value = _____ alpha = 0.05 |

## 6 Decide on the null hypothesis

*Using the critical value approach*:

Boys vs. girls on Math posttest

Since the computed *t*-value is _____ the critical *t* value, we _____ the null hypothesis.

Math pretest vs. posttest of boys

Since the computed *t*-value is _____ the critical *t* value, we _____ the null hypothesis.

Math pretest vs. posttest of girls

Since the computed *t*-value is _____ the critical *t* value, we _____ the null hypothesis.

*Using the* p*-value approach*:

Boys vs. girls on Math posttest

Since the *p*-value is _____ the alpha, we _____ the null hypothesis.

Math pretest vs. posttest of boys

Since the computed *t*-value is _____ the critical *t* value, we _____ the null hypothesis.

Math Pretest vs. Posttest of Girls

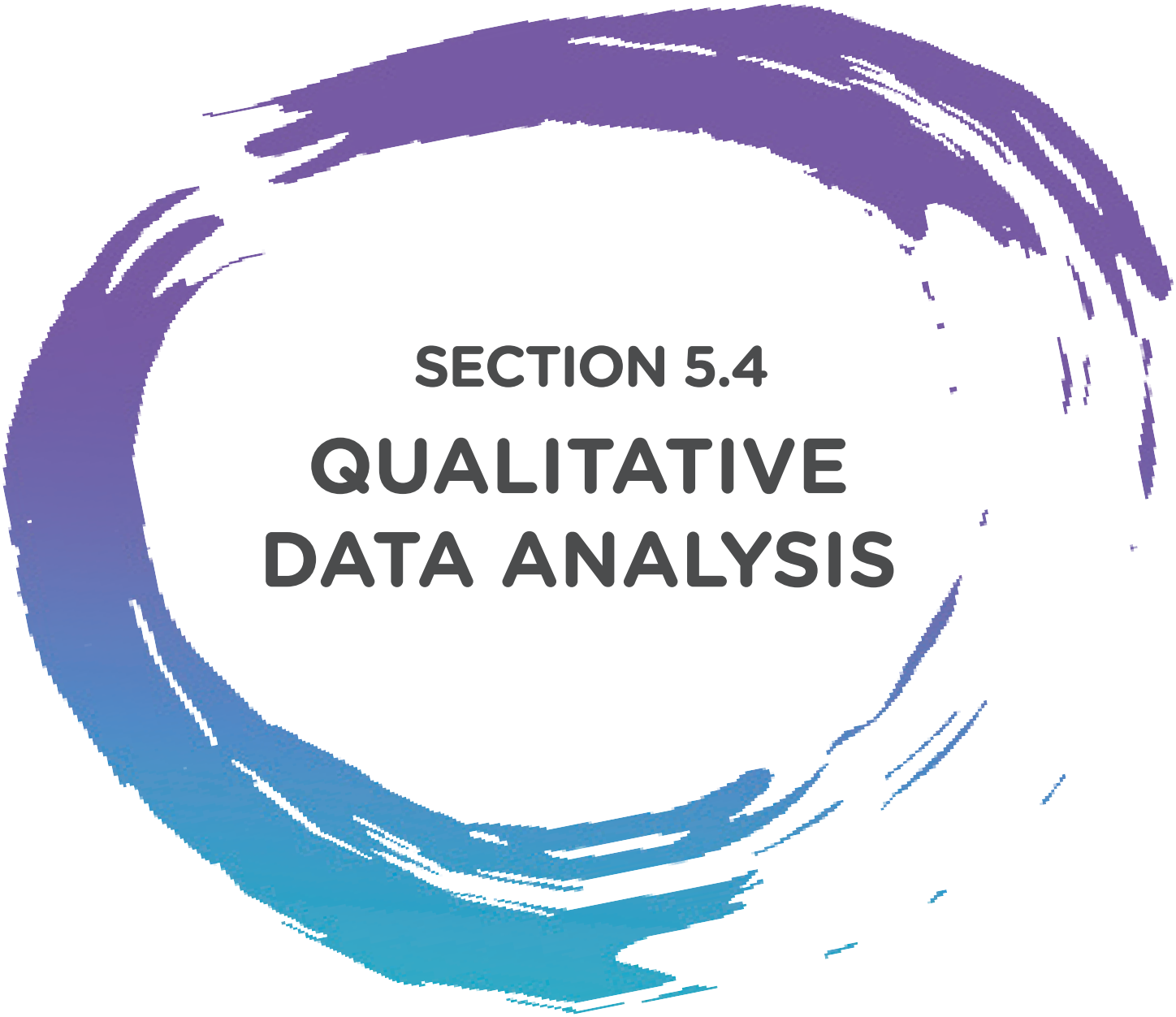
Since the computed *t*-value is _____ the critical *t* value, we _____ the null hypothesis.

## 7 Draw the conclusion

There is _____ difference between the boys and the girls in terms of Math posttest scores (*or* boys and girls _____ with regard to Math posttest scores).

There is _____ difference between the Math pretest and posttest scores of the boys (*or* Math pretest and posttest scores of the boys _____).

There is _____ difference between the Math pretest and posttest scores of girls (*or* Math pretest and posttest score of girls _____).



SECTION 5.4

# QUALITATIVE DATA ANALYSIS

## OBJECTIVES

At the end of this section, the reader will be able to:

1. explain each of the five steps in qualitative data analysis and
2. apply the steps in qualitative analysis to data provided (from the development of themes, sorting of responses according to themes, and to preparation of summary table).

## INTRODUCTION

The methods we use for undertaking the study and for collecting data have serious repercussions on our analysis and interpretation. Methods used for collecting qualitative data can be time consuming; so does qualitative data analysis.

It is a misconception to assume that qualitative data analysis is less difficult than statistical data analysis. In reality, it is more arduous and demanding of one's critical thinking and time.

Qualitative data analysis calls for the researcher to continually reflect and analyze as data are collected and make adjustments in the methods to ensure that data relevant to the research question are obtained. *Analytical* and *logical reasoning* are essential in examining each qualitative response or data.

Qualitative data analysis is applied to Action Research in which qualitative data, instead of numerical data, are collected to examine the effectiveness of an intervention. It is also utilized when pieces of qualitative evidence are gathered as a *complement* or *supplement* to numerical data.

Qualitative data collected from various sources using different techniques are assembled, reviewed, broken down (into segments), sorted (according to categories), and then "recombined" to summarize the findings and draw conclusions.

Analysis of qualitative data can be executed in five (5) steps that begins with the raw data in the form of idiosyncratic verbalizations and thick descriptions and ends with interrelated categories that synthesize the responses.

This section discusses the steps in qualitative data analysis and the process of making sense of voluminous qualitative data in order to answer a research question.

# STEPS/KEY CONCEPTS

## PREPARING QUALITATIVE DATA FOR ANALYSIS

Qualitative data analysis begins with the proper *identification* of data. Identification numbers can be assigned to each participant and/or document. Demographic data about participants should also be noted as part of the description of the sample.

Each data piece must be carefully *labelled* and *organized* to facilitate analysis. Interview and observation data have to be transcribed verbatim. Contents of documents have to be summarized comprehensively. Materials and objects have to be described in detail.

As much as possible, transcription of interview and observation notes should commence immediately after data collection. That is because some notes may not be clearly written. If these are transcribed on the same day that they are collected, these vague notes may still be clarified.

A word processor, such as MS Word, is useful when encoding transcriptions because it expedites data analysis. The following is an example of a MS Word file that contains hypothetical qualitative data.

Q. Ano ang nagugustuhan mo sa pagpasok sa paaralan? (n = 10 Grade 1 pupils interviewed)

| ID | Response |
|---|---|
| S1 | Marami akong natututunan na mga bagay-bagay |
| S2 | Lagi kong kasama ang aking mga kaibigan |
| S3 | Gustong-gusto ko ang mga tinuturo sa Math |
| S4 | 'Pag may pasok, may baon ako |
| S5 | Pinapaliwanag ng guro ang mga hindi naiintidihan |
| S6 | Masaya kaming naglalaro ng aking classmates |
| S7 | Mabait ang teacher ko, pati mga kaeskuwela |
| S8 | Natututo akong magbasa |
| S9 | May mga ginagawa kaming nakakaaliw |
| S10 | Tinutulungan ako ni teacher sa aming lesson |

## GETTING TO KNOW THE QUALITATIVE DATA

The researcher must be well-acquainted with his or her data. This is essential to qualitative data analysis. Preparing and organizing data for analysis gives the researcher the opportunity to know them.

Careful reading of data enables the researcher to discover what they mean. It is this meaning that must be extracted in order to correctly interpret the information obtained.

Transcripts of interviews and observations, summaries of documents, and descriptions of materials and objects have to be carefully read to get an idea of the scope and type of data that will be examined. The researcher's tacit knowledge of the background and setting of the study, the participants, and the topic of investigation is key to appreciating and consequently decoding of the responses. Familiarity with the data makes it easier to organize them by "segregating" responses into pieces of information that can be arranged according to discrete but meaningful categories.

The process of reviewing the data reveals key points that are repeatedly mentioned by respondents. Some responses explicitly state these while others imply them. The researcher has to "unearth" these ideas. "Chunking" or slicing responses according to concepts is an important groundwork for the next step. These chunks or segments bring to the surface the categories for classifying responses.

## DEVELOPING THEMES FROM PRELIMINARY INSPECTION

Initial reading of responses and chunking into segments come in handy as you identify general categories for the responses. *Open coding* is a term that has been used to describe this process of probing the data and extracting main thoughts that are conveyed by respondents.

A sampling of responses is sometimes sufficient to expose general patterns. Finding these patterns in the responses is called *theming*. This is simply "*drawing together codes or key terms from one or more transcripts to present the findings of qualitative research in a coherent and meaningful way*" (Sutton and Austin 2015). Theming can be done as one begins to gather and complete qualitative data. Through this, the researcher gets to direct his or her attention on finding the same patterns as data are assembled.

The themes derived from a sample of responses is used as the classification scheme for organizing responses that provide *similar* types of information into clusters. It is suggested that the coding scheme consists of three to five themes. Three themes give the researcher substantial material to discuss as findings. More than five themes tend to be unwieldy for cohesive discussion. It is recommended that categories be revised and broadened if more than five are drawn from the data.

The following table lists the themes elicited from the data given earlier.

Q. Ano ang nagugustuhan mo sa pagpasok sa paaralan?

| Themes |
|---|
| Academic/Learning (Learn) |
| Activities (Act) |
| Social relations (Soc) |

When you think you may have extracted the major themes based on the initial reading of your data, review them and find further interrelations. Revisit your research question and make sure that the themes you plan to use in organizing responses will address it. It is the research question that drives the study so it should be complied with by data analysis. Themes that are not related to the research question should be either eliminated or revised.

Take note that not everything that a respondent or participant says or does have to be analyzed. Analysis is reserved only to responses that are pertinent to the research question. Such irrelevant data may be likened to the *outlier* in quantitative data analysis, which is sometimes excluded in the processing because they tend to distort the general trend of the data.

Codes or labels for themes are often used as aids in the classification of themes. Labels may be in the form of terms, which are often used by participants themselves.

In the example above, notice the terms "Learn", "Act," and "Soc," which are used as codes or labels to represent the themes.

## CLASSIFYING RESPONSES ACCORDING TO THEMES

Having identified the themes, the researcher now has to return to each response and assign it to one of the themes. To facilitate this, key words in the responses are marked using the codes or labels. The key words may be underlined or circled and the codes or labels of the themes may be written on top or beside them. Color coding using highlighter pens, with one color representing a theme, may also be done. The colors make it easy for the researcher to see which theme/s is/are the major one/s.

It might happen that a response includes two or more themes. Hence, parts or segments of a response may be classified to different themes. For this reason, the total frequency across themes may be *more* than the sample size n.

If a response *cannot* be assigned to any of the themes, the researcher can either *revise* the themes to *include* the response or create the category *Others* that can encompass such responses.

As you categorize responses according to themes, keep your focus on the analysis and avoid being distracted by responses that are *not* pertinent to the research question. Watch out for these unrelated responses and ignore them. For example, if the interview question asked the interviewees to name one thing that they like about school and one respondent misunderstands and narrates instead his or her travel going to school, it is sensible to exclude it from the analysis or from the data set altogether. This is called *filtering*. In the report, however, it might be important and interesting to *reveal* the occurrence of such a response, either at the end of the *Findings* or in the *Reflection* part, which is included at the end of the Action Research report.

The following is an example of the classification of responses according to themes.

Q. Ano ang nagugustuhan mo sa pagpasok sa paaralan?

| **Themes and responses** |
|---|
| 1. *Learning*<br>• Marami akong natututunan na mga bagay-bagay (01)<br>• Gustong-gusto ko ang mga tinuturo sa Math (03)<br>• Pinapaliwanag ng guro ang mga hindi naiintidihan (05)<br>• Natututo akong magbasa (08)<br>• Tinutulungan ako ni teacher sa aming lesson (10) |
| 2. *Activities*<br>• Masaya kaming naglalaro ng aking classmates (06)<br>• May mga ginagawa kaming nakakaaliw (09) |
| 3. *Social Aspect*<br>• Lagi kong kasama ang aking mga kaibigan (02)<br>• Mabait ang teacher ko, pati mga kaeskuwela (07) |
| 4. *Others*<br>• 'Pag may pasok, may baon ako (04) |

When a theme is mentioned often by respondents or by many of the respondents, then it is a crucial finding. In view of this, it is important to review the themes and the responses classified under each theme before finalizing the results and reporting them. The themes and the responses must give light to the research question.

You may validate your analysis by doing *peer debriefing*, which is basically the process of asking a *disinterested* but equally competent researcher or peer to examine the classification scheme used. This can also be performed by having a fellow researcher conduct his or her own qualitative data analysis without looking at your categorization. The themes you developed can be compared with those derived by your peer. You can

either keep the categorization you have or adjust it by including some of the themes from your peer's analysis.

### SUMMARIZING THE RESULTS IN A TABLE

The last step in qualitative data analysis is to prepare a table that summarizes the findings and serves as basis for conclusions. Results can be shown using a graph, table, or matrix (Nichols 2018).

The follwoing is an example of a summary in table format. It indicates the themes, sample responses, number of responses (frequency) classified under each theme, percentages of responses, and ranking of themes based on frequencies, giving rank 1 to the theme with the highest frequency.

**Table 5.4.1.** Summary of qualitative responses.

| Themes | Sample Responses | Frequency | Percent (%) | Rank |
|---|---|---|---|---|
| 1. Learning | Marami akong natututunan na mga bagay-bagay (01) | 5 | 50 | 1 |
| 2. Activities | May mga ginagawa kaming nakakaaliw (09) | 2 | 20 | 2.5 |
| 3. Social aspect | Mabait ang teacher ko, pati mga kaeskuwela (07) | 2 | 20 | 2.5 |
| 4. Others | 'Pag may pasok, may baon ako (04) | 1 | 10 | 4 |

## PRACTICE/EXERCISE

The following are data collected from Grade 9 students after attending a training program to help them develop leadership. Take time to analyze these data. Once done, display the results in a table using the same format as illustrated. Bring your output to the next LAC session.

Q. What changes did you see in yourself as a result of attending the Leadership Training Program? (Anong pagbabago ang nakita mo sa iyong sarili pagkatapos sumali sa LTP?)

| ID no. | Responses |
|---|---|
| 01 | I learned how to deal with conflict among my classmates. |
| 02 | Now I know what traits a leader should have. |
| 03 | I realized that I still have a long way to go to be a leader. |
| 04 | Hindi pala tama 'yung style na ginagawa ko sa aming org. |

| | |
|---|---|
| 05 | Kahit 'di pa naman ako leader sa ngayon, feeling ko gusto kong maging isang leader balang araw. |
| 06 | A leader has to be a model first before he can expect his members to follow. |
| 07 | I think I have to improve my communication skills to become a better leader. |
| 08 | Many of the activities helped me reflect on my traits as a leader. |
| 09 | Hindi pala madali maging isang leader. |
| 10 | It was good for us to learn how to be a good leader so that we can be more effective. |
| 11 | I still think that I am better at following than leading. |
| 12 | I have to lead by example. |
| 13 | I must be willing to sacrifice myself for the sake of others. |
| 14 | Jesus is my example of how to be a good leader. |
| 15 | Akala ko ang leadership ay may kinalaman lang sa pagbibigay ng utos; ngayon alam ko na hindi pala. |

| Themes | Sample Responses | Frequency | Percent (%) | Rank |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

## REFERENCES


Dudovskiy, John. 2018. Qualitative Data Analysis. Research Methodology (website). Accessed May 2018. https://research-methodology.net/research-methods/data-analysis/qualitative-data-analysis/.

Nichols, A.H. 2018. "Analyze Qualitative Data." *Evaluation Toolkit*. The Pell Institute for the Study in Higher Education Policy and Pathways to College Network (website). Accessed May 21, 2018.http://toolkit.pellinstitute.org/evaluation-guide/analyze/analyze-qualitative-data/.

Australian Aid

DepED
DEPARTMENT OF EDUCATION

SECTION 6.1

# WORKSHEET FOR ACTION RESEARCH PROPOSAL

BEST Basic Education Sector Transformation

| Parts of Action Research Proposal | Ideas/Responses |
|---|---|
| I. **Context and rationale**<br><br>**a.** What is the area or focus of your study? What is its importance or relevance to the classroom problem or situation? How will it answer the problem/ issue/challenge you have encountered in the classroom?<br><br>**b.** What information do you have or what current research have you read along this area? What are the gaps, if any, that you plan to address? (You may interview your colleagues for interventions they have applied in the past to solve the problem. You may also search the internet for studies related to your topic or intervention.)<br><br>**c.** What theory, related studies, DepEd policies, or laws have you come across to strengthen your claims?<br><br>**d.** What is your purpose or motivation in pursuing the topic of your Action Research? | |

II. **Innovation, Intervention, or Strategy**

**a.** What are the rationales, objectives, extents, and limitations of the innovation, intervention, or strategy you are proposing?

**b.** How will the innovation, intervention, or strategy address the problem or issue?

III. **Action Research question/s**

**a.** What issues or problems do you wish to answer through your Action Research?

a. What research question clearly expresses what you want to find out in the study? (Be sure that the research question mentions the intervention or treatment to be implemented.)

b. What part of the research question conveys the desired change or improvement?

IV. **Action research methods**

**a.** What research design should be suitable to the nature and purpose of the Action Research? Provide a brief description.

**b.** Who are the participants of the study? State how many and what sampling design will be used.

**c.** What data collection method/s will be used? Describe them. Ensure that they are aligned with the research questions. What research instrument/s will be appropriate in order to obtain the desired data or information?

**d.** What technique/s for data analysis will be used? Describe them. Explain why the technique/s is/ are appropriate for the nature of the data/information to be collected and for addressing the research question/s.

## V. Work plan and timeline

**a.** How long do you intend to engage in the Action Research? Provide a detailed work plan from the start to the completion of the Action Research.

b. What strategies will you employ to ensure that you are on track with your plan? Include a Gantt chart or timetable and explain its content.

VI. **Cost Estimates**

a. What expenses do you foresee to incur as you conduct your Action Research? List the items in detail.

b. For each item or expenditure, how much do you need? Put these in a table that makes it easier to read and examine.

c. Do the items/ expenditures adhere to the BERF guidelines?

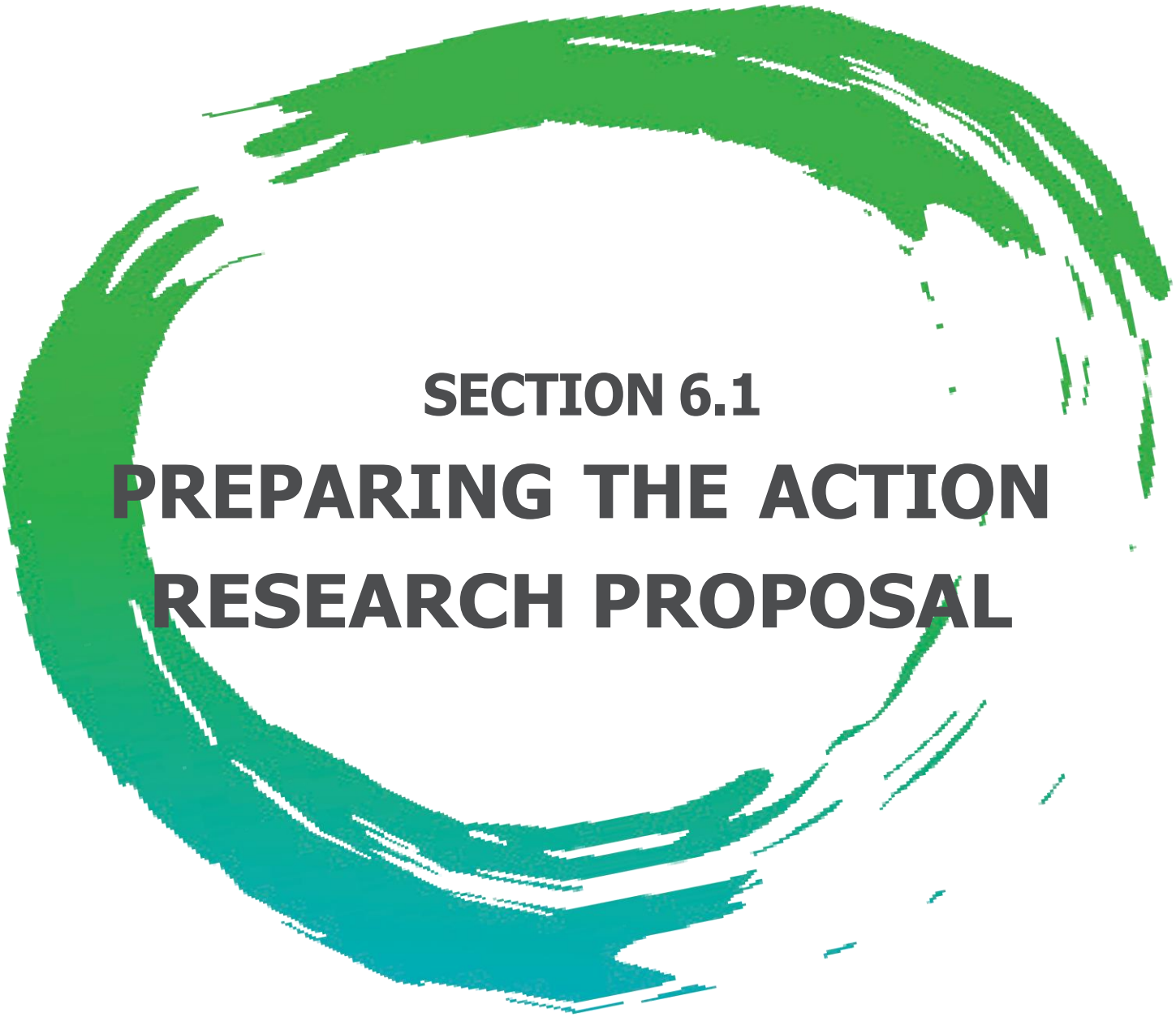
VII. **Plans for dissemination and utilization**

**a.** How do you intend to disseminate the findings of your Action Research? Mention the tentative date of dissemination.

**b.** How will or can the output and recommendations be utilized? Explain clearly.

**c.** Who should implement the recommendations and when should they be implemented?

*Note:* Use a separate sheet if you need more space.



## SECTION 6.1

# PREPARING THE ACTION RESEARCH PROPOSAL

# OBJECTIVES

At the end of this section, the reader will be able to:

1. name the different parts of an Action Research proposal;
2. describe how each part of the Action Research proposal is written; and
3. improve his or her professional experience in writing an Action Research proposal.

# INTRODUCTION

When preparing to write an Action Research proposal, it is expected that you have already developed a clear understanding of what Action Research is. At this point, you must have already reflected on and identified the topic, problem, or issue in the classroom that you wish to address through Action Research. You should by now have a clear idea of the innovation, intervention, or strategy aimed at improving the classroom situation you are interested in.

It is also assumed that you are already well-acquainted with the Action Research framework as discussed in section 1 of this session guide. Having an understanding of the framework will help you in appreciating the parts of the Action Research Proposal.

The essentials of Action Research such as research topic, research question, hypotheses, research design, sampling, and data collection and analysis methods discussed in the previous sections should have helped you prepare for your Action Research proposal.

First, what is a research proposal? A research proposal is a document that covers the various facets of the proposed study. It provides the context and rationale, aims, potential contribution, research design, samples, data gathering technique and analysis plan. (Alonzo, 2019) However, a research proposal is more than just a set of documents but it is your tool to access the Basic Education Research Fund and other research grant mechanisms.

This section will guide you in the actual writing of your Action Research proposal.

# STEPS/KEY CONCEPTS

## I. PARTS OF THE ACTION RESEARCH PROPOSAL

The following are the main parts of the Action Research proposal:

1. Context and Rationale
2. Innovation, Intervention, and Strategy
3. Action Research Question/s
4. Action Research Methods
5. Work Plan and Timeline
6. Cost Estimates
7. Plans for Dissemination and Utilization

To help you write each part, the following suggestions are offered. As you follow these, you will be able to put together each part and, eventually, the complete Action Research proposal. Take note of these pointers and use them as your guide in preparing your proposal.

### A. CONTEXT AND RATIONALE

The introduction and rationale provides the context of and argues for the importance of the research area. This should not be more than 500 words. Therefore, it needs to be concise but clearly articulates the context, rationale, related studies, and how your proposed research relates to those related studies. It also includes the general aim and the potential contribution of the proposed research (Alonzo, 2019).

1. Specify the area or focus of your proposed Action Research and explain its importance. Describe how your proposed study will answer the problem or issue in your classroom.
2. Cite any data or current research on the area of your study and highlight the *gap* that will be addressed by the proposed Action Research. Include a summary of the literature you have reviewed or statements and opinions you have obtained from interviewing your colleagues about previous strategies or interventions used to solve the target problem or issue.
3. Include any theory, DepEd policies, or government laws that will strengthen your claims about the problem situation and the intervention that you will implement.

4. Provide a brief explanation of your specific purpose for doing the study.
5. State what outcomes you hope to see and what actions you are planning to execute in order to examine the usefulness of the intervention in solving the problem.
6. Use clear and simple words. Be concise and straight to the point.

## B. INNOVATION, INTERVENTION, OR STRATEGY

Based on the characteristic of the students, schools, and schooling system, you need to research what appropriate innovation/intervention/strategy that can be used to address the issue/s you are trying to address. Make sure to provide a strong theoretical support. You need to have a clear argument why you have selected/ developed the innovation/intervention/strategy you are planning to implement. You can draw from various theories and related studies to build your argument (Alonzo. 2019).

1. Expound on the intervention that you will use in your Action Research.
2. Present the rationale for the study and the objective/s you want to accomplish.
3. Declare what you foresee as the limitation/s of the innovation, intervention, or strategy that will be applied.
4. Specify the chance of the innovation, intervention, or strategy of solving the problem or issue.
5. As you write, think of how a colleague could also use your plan in his or her own classroom.
6. If you are working on the Action Research with colleague/s, identify them and indicate their role/s. Elaborate on how the research work will be divided between you and your team member/s.

## C. ACTION RESEARCH QUESTION/S

1. Recall your reflection and the purpose of your proposed Action Research to be able to formulate your Action Research question/s. It is a good idea to read again the related literature and studies you have found for your research.
2. State your primary Action Research question. Review and verify it to ascertain that it is aligned with the purpose of your study.
3. The research question must correspond clearly to the identified problem or issue and must mention the intervention you will use and the outcome in terms of change or improvement as a result of its implementation.
4. You may include, at most, three secondary research questions. Be sure to arrange them logically.

**Note:** You may refer to section 2 of this guide to help you in writing your Action Research question.

## D. ACTION RESEARCH METHODS

1. Identify the research design that you will utilize and explain it in relation to the intervention that you will apply and the dependent variable that you will collect to examine its effectiveness. Defend the suitability of the design to the nature and purpose of your Action Research.
2. Describe the sample or the participants of your study in terms of demographic characteristics and other traits that support their inclusion. Specify also and explain the sampling method that will be used.
3. Enumerate and then briefly describe the method/s that you will use for data collection. Ensure that this/these is/are congruent with the research question.
4. Explain each data collection method—its purpose and intended respondents, length and format, sections and items, and desired data/information that will be obtained from each instrument.
5. Present the data analysis method. For each data collection method, specify the technique/s for summarizing information and linking to research question/s.

**Note:** A review of the previous sections on Designing the Action Research, Collecting the Data, and Analyzing the Data in this guide will give you ideas on how to write your proposal.

## E. WORK PLAN AND TIMELINE

You need to demonstrate that you can conduct your research proposal within a specific timeframe. You need to give a sensible timeline indicating plans from commencement right through to submission. In the timetable, you need to indicate the major milestones with specific activities of your proposed research. (Alonzo, 2019)

1. This part should include a detailed discussion on your work plan that should cover activities from the beginning of the Action Research to its completion.
2. The schedule of the activities should be both reasonable and practical to show concretely how the proposed Action Research will progress over the planned period of its execution.
3. The general scheme and line-up of activities reveals your ability to put into reality the ideas you have by listing clearly and sequentially the steps to be

taken.

4 The work plan and timeline can be displayed in a Gantt chart or a timetable as shown below.

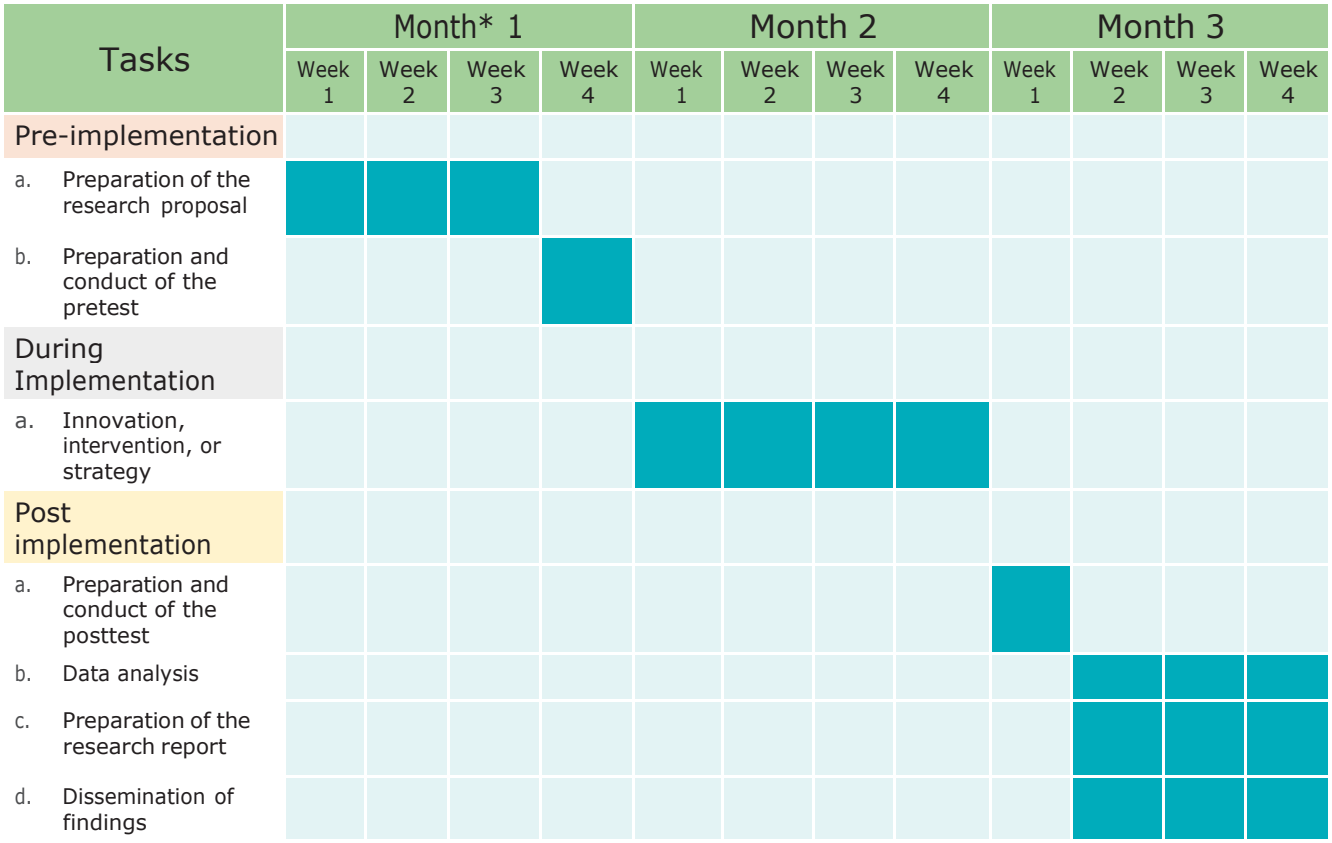



**Figure 6.1.1.** Example of a Gantt Chart.

*__Note:__ Specify the month when preparing your own Gantt chart.

**Table 6.1.1.** Example of a Timetable.

| Objectives | Activities/strategies | Responsible persons | Estimated time allotment/completion date | Desired outcomes |
|---|---|---|---|---|
| To submit the Action Research proposal | Write the Action Research proposal following the suggestions | Teacher/Researcher | Weeks 1 to 3 of June | Action Research proposal submitted for approval |
| To obtain baseline data for comparison with posttest data | • Prepare pretest items<br>• Administer pretest | Teacher/Researcher | Week 4 of June | Pretest data as baseline |
| To implement innovation | Provide intervention to class | Teacher/Researcher | Weeks 1 to 4 of July | Intervention applied to students as planned |

| | | | | |
|---|---|---|---|---|
| To collect posttest data | Administer posttest | Teacher/Researcher | Week 1 of August | Posttest data for comparison with pretest data (baseline) |
| To test effectiveness of the innovation | Analyze pretest and posttest data | Teacher/Researcher with<br><br>statistics consultant | Week 2 of August | Statistical output relevant to the research question |
| To submit final Action Research report | Write results of the Action Research | Teacher/Researcher | Week 3 of August | Action Research final report submitted to DepEd |
| To disseminate the results of the Action Research | Give a one-hour presentation of the Action Research | Teacher/Researcher | Week 4 of August | Public presentation of results |

## F. COST ESTIMATES

Cost estimates provide the proposed expenses for the implementation of the action research. Proposed expenses must follow the accounting and auditing rules and regulations of the funding mechanism.

1. This part is a detailed presentation of expenditure and their corresponding costs. This part of the Action Research proposal will indicate your skill in making projections about specific expenses that might be incurred as you execute your study.
2. The items and costs must be a realistic reflection of the funds required by the proposed Action Research. If you wish to request financial support through the Basic Education Research Fund (BERF), the costs must follow the BERF guidelines.
3. Consider the following common expenditures for Action Research as you prepare your own list:
   a. supplies and materials (e.g., bond papers, pens, printer ink, stapler)
   b. communication expenses (e.g., postage stamp, courier service, call cards, internet use)
   c. transportation expenses (e.g., fare for public transportation such as taxi, bus, jeepney, tricycle)
   d. reproduction, printing, and binding costs (e.g., photocopying services)
   e. food expenses (e.g., meals and snacks)
   f. expenses related to research dissemination (e.g., tarpaulin, tarpaulin stand, handouts)
4. You may refer to DepEd Order No. 16, s. 2017 (Research Management Guidelines) for the grant cost.

### G. PLANS FOR DISSEMINATION AND UTILIZATION

1. Outline the strategies for the dissemination of the findings of your Action Research in this part of the proposal.
2. Offer ways by which the results and recommendations of the proposed Action Research might be applied in your school and in other settings.

### H. WRITING THE REFERENCES

1. Since you will be including a summary of related previous studies and might also be citing information from other sources, it is required that you include a list of references in your Action Research proposal.
2. Use a consistent citation style for citation and reference list.
3. Remember to keep your references and organize them as you work to be ready for the preparation of your list. It is good practice to write notes and references on index cards so that it would be easy to organize them according to themes or topics when you begin to write your proposal and, eventually, the report.
4. It is important to choose critically the materials that are useful and relevant to your study and, therefore, are necessary to be cited.

## II. GUIDELINES ON HOW TO WRITE THE ACTION RESEARCH PROPOSAL

### A. Writing style

The following list presents standards to observe as you draft your proposal.

1. **Paragraph**. Use plain and simple language as well as short words and brief sentences. Arrange sentences in logical order and join related ideas with appropriate transition words.
2. **Acronym**. Indicate what the letters stand for at the first occurrence in your Action Research proposal.
   *Example*: The Office crafted its second Division Education Development Plan (DEDP).
3. **Tense**. The Action Research proposal is written in present and/or future tense.
4. **Person**. Use of the first-person (I, we, our), second-person (you, yourself), and third-person (he, him, she) point of view in writing the proposal is acceptable. However, once you have chosen a point of view, you must use it consistently

throughout a sentence or paragraph.

5. **In-text citation.** Cite sources properly to avoid plagiarism issues. Use a consistent citation style. Below aresome examples using the American Psychological Association (APA) format of in-text citation:
   a. Single author (book)—Provide the author's last name followed by a comma and the year of publication.
      *Example*: (McNiff, 2013)
   b. Two authors (book)—Use an ampersand (&) before the second author's last name followed by a comma and the year of publication.
      *Example*: (Herr & Anderson, 2014)
   c. Three to five authors (book)—Give all the authors' names the first time the citation occurs. Include only the last name of the first author followed by "et al." for subsequent citations.
      *Examples:*
      (Nugent, Malik, & Hollingsworth, 2012)
      (Nugent et al., 2012)
6. **References***.* All sources cited in your proposal should appear in the *References* section. The entries must be arranged alphabetically according to the last name of the first author. Works by the same authors are arranged in order of year of publication with the earliest one first.

# PRACTICE/EXERCISE

Apply what you have just learned in this section by drafting the parts of your Action Research proposal. Follow the guidelines and standards discussed.

Use the following checklist for Action Research proposal to evaluate your work. This will help you ensure that you are writing according to the content prescribed in each part. Put a check on each blank if your work has met each criterion.

## Context and rationale

_____ Are the reasons for conducting the proposed Action Research clearly described?
_____ Have you presented why the issue is important to you?
_____ Does the literature review relate to your reflection and the focus of your study?
_____ Are the sources you included relevant to the purpose of your study?
_____ Have you clearly articulated the purpose of the study focusing on the intervention that will be used and the outcomes that are desired?
_____ Have you provided an explanation of the results that you hope to obtain from your study?

## Innovation, intervention, and strategy

_____ Is the intervention based on what was revealed in the review of literature?
_____ Did you explain in detail the intervention that you will use in your Action Research by explaining the rationale, objectives, extents, and limitations of the study?
_____ Did you describe how likely the innovation, intervention, or strategy will address the problem or issue?
_____ Have you described the innovation, intervention, or strategy with enough details so that a colleague or another researcher could also implement it?

## Action Research question/s

_____ Are the research questions and the secondary questions aligned with the purpose statement you presented in the *Context and Rationale*?
_____ Is the research question related to the problem or issue that has been identified?
_____ Did you include the intervention you will use and the outcome you desire in the research question?

## Action Research methods

_____ Did you identify the research design that is appropriate for the topic and the research question?
_____ Did you mention the sample or participants and other sources of data and information for your study?
_____ Did you specify the data collection method/s (e.g., test, rating scale, questionnaire, interview, observation, documents or materials)?
_____ Have you included a description or an explanation of how the data will be analyzed?

## Work plan and timeline

_____ Does your work plan show in detail the sequence of activities or events in the duration of your study?
_____ Have you clearly indicated the dates for the activities?
_____ Did you name the person/s responsible for each activity?
_____ Have you specified the desired output from each activity?
_____ Did you present the work plan and schedule using a Gantt chart or a timetable?

## Cost estimates

_____ Did you list all possible expenditures in the study?
_____ Have you given reasonable estimates for the expenditures?

## Plans for dissemination and utilization

_____ Does your Action Research proposal contain a plan for sharing the results of your study?
_____ Did you write how you see the results may be utilized and the ensuing recommendations be carried out in your school and others?

# REFERENCES

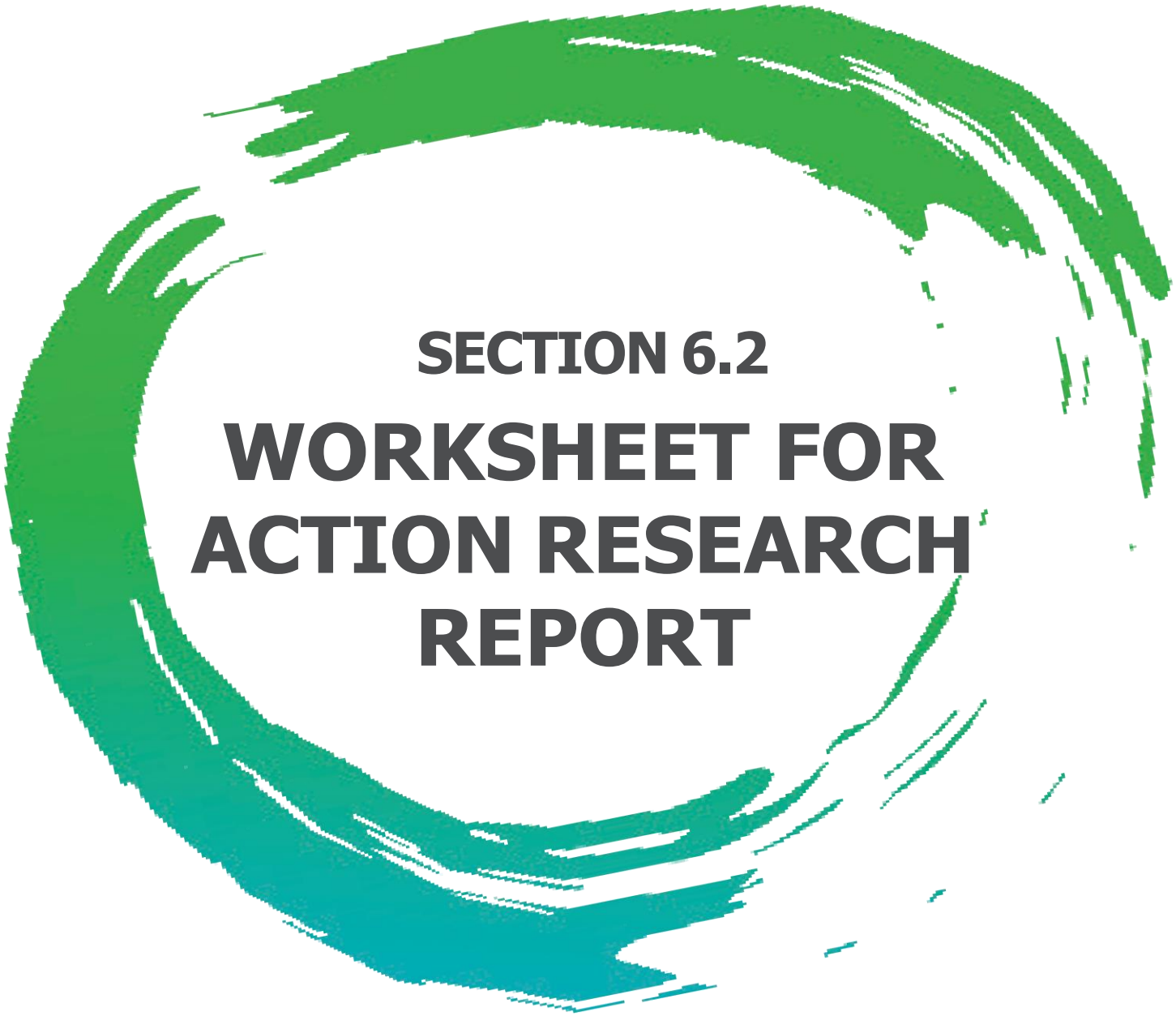

Department of Education. 2017. Research Management Guidelines. DepEd Order 16, s. 2017.

Department of Education. 2017. Supplemental Research Guides and Tools. DepEd Memo 144, s. 2017.

Hendricks, Cher. (2012) 2016. *Improving Schools through Action Research: A Reflective Practice Approach.* Boston, MA: Pearson.

Paiz, J., Angeli, E., Wagner, J., Lawrick, E., Moore, K., Anderson, M., Soderland, L., A. Brizee, and R. Keck. 2018. "Reference List: Electronic Sources (Web Publications)." Purdue University (website). Accessed May 21, 2018. https://owl.english.purdue.edu/owl/resource/560/01/.

Paiz, J., Angeli, E., Wagner, J., Lawrick, E., Moore, K., Anderson, M., Soderland, L., A. Brizee, and R. Keck. 2018. "In-text Citations: The Basics." Purdue University (website). Accessed May 21, 2018. Retrieved from https://owl.english.purdue.edu/owl/resource/560/02/.



## SECTION 6.2

# WORKSHEET FOR ACTION RESEARCH REPORT

| Parts of Action Research Report | Ideas/Responses |
|---|---|
| I. **Context and Rationale**<br>a What is the area or focus of your study? What is its importance or relevance to a classroom problem or situation? How will it answer the problem/ issue/challenge you have encountered in the classroom? | |
| b What information do you have or what current research have read along this area? What are the gaps, if any, that you plan to address? (You may interview your colleagues for interventions they have applied in the past to solve the problem. You may also search the internet for studies related to your topic or intervention.) | |
| c What theory, related studies, DepEd policies or laws have you come across to strengthen your claims? | |
| d What is your purpose or motivation in pursuing the topic of your Action Research? | |

II. **Innovation, Intervention, or Strategy**

a What are the rationales, objectives, extents, and limitations of the innovation, intervention, or strategy you are proposing?

b How will the innovation, intervention, or strategy address the problem or issue?

**III. Action Research question/s**

a What issues or problems do you wish to answer through your Action Research?

b What research question clearly expresses what you want to find out in the study? (Be sure that the research question mentions the intervention or treatment to be implemented.)

c What part of the research question conveys the desired change or improvement?

## IV. Action Research Methods

a. What research design should be suitable to the nature and purpose of the Action Research? Provide a brief description.

b. Who are the participants of the study? State how many and what sampling design will be used.

c. What data collection method/s will be used? Describe them. Ensure that they are aligned with the research questions. What research instrument/s will be appropriate in order to obtain the desired data/ information?

c. What technique/s for data analysis will be used? Describe them. Explain why the technique/s is/are appropriate for the nature of the data/ information to be collected and for addressing the research question/s.

V. **Research Findings**

a What are the results of analyses performed on data? Present them in order to answer the research question.

b What are the outputs of analyses according to each secondary question? Present them according to each. Include graphs and tables that will help the reader make sense of the outcomes of the research.

VI. **Reflection**

a What have you learned from the outcome of the Action Research?

b In particular, what have you learned about the intervention that you implemented?

c Do your findings confirm the effectiveness of the intervention? How?

d What aspects of the study contributed to its success?

e Could you have improved the implementation of the intervention to maximize its effects? Why?

f If you were to do the study again or in future implementation of the intervention, what aspects of the study would you improve or change?

g What has/have been your learning experience/s as a researcher in conducting the study?

## VII. Action Plan

a. What do you plan to do next looking at the findings of your study and comparing them with the objective/s of your Action Research?

b. How would you confirm the effectiveness of the intervention?

c. What additional evidence might you collect in order to ascertain the usefulness of the intervention?

d. How will you continue to apply the intervention to other students in your class?

e. Based on the results of the study, what can you do to further improve the teaching and learning process and/or for the innovation, intervention, or strategy to succeed in future applications?

f. What might you do to propagate the implementation of the intervention on other learners in other classes and/or schools?

g. What plans do you have for the dissemination and utilization of the results of the Action Research?

h. Do the activities displayed on the Action Plan template specify the objectives, activities or strategies, persons involved, and time frame?

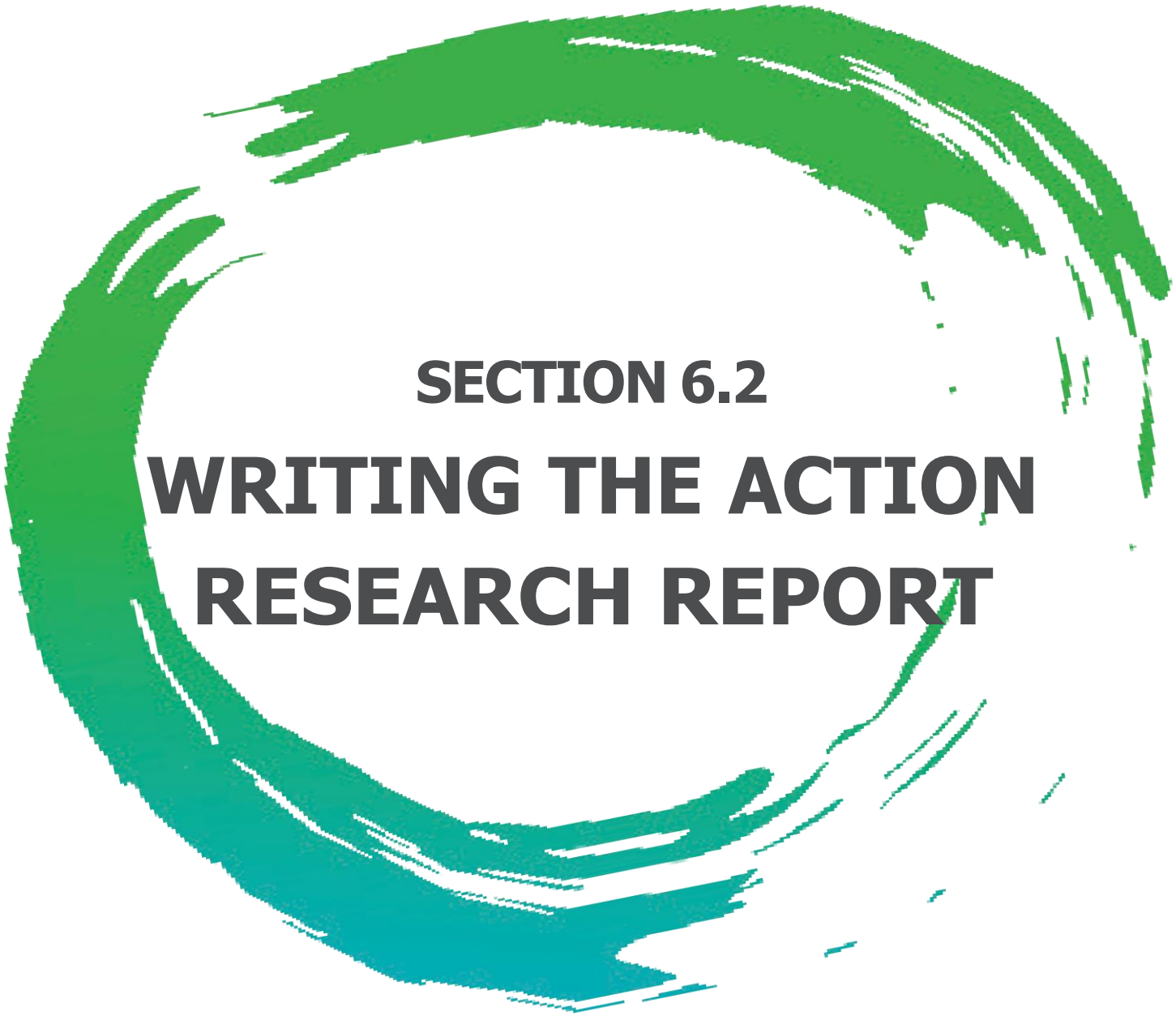
VIII. **Financial Report**

a Was the amount enough or did you have to spend more than planned for each item or expenditure included under the Cost Estimates in the Action Research Proposal? What reason/s would explain the excess expense?

b Do you have the necessary information on fund/grant utilization or expenses? You may put these details on the Summary of Expenses table to make this part of the Action Research Report easier to read and examine.

c Did your overall expenditures adhere to the BERF guidelines?

*Note:* Use a separate sheet if you need more space.



## SECTION 6.2

# WRITING THE ACTION RESEARCH REPORT

# OBJECTIVES

At the end of this section, the reader will be able to:

1. name the different parts of an Action Research report;
2. follow the guidelines in writing an Action Research report; and
3. identify specific sections of an Action Research report that pertain to each part as outlined.

# INTRODUCTION

The results of your Action Research can be disseminated in many ways. Among the first methods is the writing of the full Action Research report. From this report, an executive summary, a journal article, a news or newsletter article, a poster presentation, or a conference paper presentation can be extracted. A forum may also be organized for the sharing of the results of several Action Researches conducted by teachers in one school or one schools division.

Writing the Action Research report requires you to pay attention not only to the specific parts required but also to the style of writing. Some of the main parts of the Action Research proposal are also included in the report, such as the *Context and Rationale; Action Research Question/s; Innovation, Intervention, or Strategy; Action Research Methods;* and *References*. The other parts that are not present in the proposal are *Research Results* (or *Findings*), *Reflection*, *Action Plan*, and *Financial Report*. There are also a few preliminary parts that have to be written.

This section will discuss the parts of the Action Research report to help you prepare this important document about your study. The presentation will follow the sequence of these parts in the report.

# STEPS/KEY CONCEPTS

## I. PARTS OF THE ACTION RESEARCH REPORT

### A. Preliminary Parts

#### 1 Title page

- contains the author's/authors' full name/s, the schools division/s of the author/s, the title of the Action Research, and the date of the completion of the study

- title of the Action Research should be in capital letters and should not exceed 16 words that can fit in an inverted pyramid form

### 2 Abstract

- presents a brief summary of the Action Research
- also called as "research-in-miniature"
- 200–250 words
- maximum of 1 ½ pages in single line spacing
- consists of summary of sampling, data collection and data analysis methods, and the final results of the Action Research
- guides readers in choosing parts of the Action Research report that they want to read further

### 3 Acknowledgement

- contains words expressing appreciation and gratefulness to individuals or institution/s that had contributed, one way or another, to the pursuit and completion of the Action Research in one page
- makes use of concise statements without using strong emotive language

### 4 Table of contents

- guides readers of the report on finding specific parts of the report
- helps readers to easily navigate through the report if there are parts that they want to read more fully
- lists parts of the report and the pages where to find them
- begins with preliminary pages
- includes pages for the *List of Tables* and *List of Figures* and the prescribed parts of the report
- indicates also the pages for *References* and of the documents cited as *Appendices*

## B. Parts Common with the Action Research Proposal

### 1. Context and rationale

- describes the area or focus of the Action Research and the reason/s why the topic is significant
- mentions the specific objective/s or purpose/s of the study
- gives explanation for how the Action Research answered the problem or issue that the investigator/s had wanted to address
- includes any data or current research related to the topic and any gap/s covered by the Action Research

- cites any theory, related studies, DepEd policies, or laws that supported the hypothesis of the study regarding the intervention or treatment applied
- summarizes activities that had been undertaken to accomplish the objective/s of the Action Research

2. **Innovation, intervention, or strategy**
   - details description of the innovation, intervention, or strategy implemented in the Action Research
   - enumerates specifies activities in the implementation with corresponding dates, including changes in procedures to adjust to certain conditions or situations
   - clarifies how the treatment was able to solve the problem or issue of interest
   - identifies roles or tasks performed by fellow researchers in relation to the conduct of the study
   - presents accounts of data collection methods and materials, which are then cited as appendices
3. **Action Research question/s**
   - states the research question and any secondary questions; secondary question/s must be in consonance with the main research question and must be logically ordered
   - includes an introductory statement for the reader to appreciate the questions formulated
   - expresses clearly the purpose of the Action Research with reference to the intervention that was applied
4. **Action Research methods**
   - incorporates the four (4) important procedures in conducting the study: *Research Design*, *Sample/Participants* or *Sources of Data/Information*, *Data Collection Method/s*, and *Data Analysis Techniques*
   - presents the research design with explanation on its suitability with regard to the nature and purpose of the Action Research
   - describes the sampling procedure and the participants in terms of demographic information and other relevant characteristics
   - presents narrative about data collection method/s used in terms of format, number of items or questions, and other relevant features such as pilot testing, reliability, and validity, including steps in collecting data; references are made to the actual instruments provided as appendices
   - identifies technique/s for data analysis with elaboration on their appropriateness in answering the research question/s.

## C. Closing Parts of the Action Research Report

### 1. Research results/findings

- presented in relation to the research question/s, not according to items in the instrument/s used
- presented in the forms of tables, graphs, charts, and diagrams with readable headings; narrative explanations and interpretation of results should precede tables and graphs (labelled as "Figure")
- tables and figures are sequentially labelled using numbers; labels are written on top for tables and at the bottom for figures
- includes implications and cites probable causes of the findings
- presents clear discussions of findings with as much detail as could be extracted from the analyses

### 2. Reflection

- a unique part of the Action Research report
- presents a narrative account of what the researcher has learned from the outcome/s of the study
- can also include significant experiences in the conduct of the study
- ideas for this part of the Action Research report can be generated using the following guide questions

**Guide Questions for Reflection**

1 What have you learned from the outcome of the Action Research?

I learned that _____

_____

2 What have been your learning experience/s as a researcher in conducting the study?

I realized that _____

_____

3 What aspects of the study contributed to its success?

The facilitative aspect/s of the Action Research was/were

_____

_____

3 What aspects of the study should be changed or improved in future implementation of the intervention?

It would have been better if _____

_____

### 3. Action plan

- lays out the researcher's next steps on how to apply the results of the Action Research
- specifies steps or activities that the researcher can execute from the results of the study to enhance the teaching and learning processes
- includes actions that will help convey the usefulness of the innovation, intervention, or strategy in other settings
- offers suggestions on how to utilize the research results
- may be presented in narrative or tabular, or both; the following table can be used as template in presenting the Action Plan

| Objective/s | Activities/Strategies | Persons involved | Time frame |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

### 4. Financial Report

- pertains to the fund/grant utilization report and/or cost estimates including supporting documents such as *Summaryof Expenses*
- *Cost Estimates* is also a part of the Action Research proposal
- items and amount included in the *Liquidation/Reimbursement Report* should conform with the approved *Cost Estimates* provided in the proposal; the following template may be used as guide for the financial report

| **Eligible items** (DepEd Order 16, s. 2017) | **Particulars** | **Quantity** | **Unit cost** | **Total Cost** |
|---|---|---|---|---|
| a. Supplies and materials | | | | |
| b. Domestic travel expenses | | | | |
| c. Communication expenses | | | | |
| d. Reproduction, printing, and binding costs | | | | |
| e. Food and other incurred expenses during conduct of research (surveys, FGDs) | | | | |
| f. Other expenses related to research dissemination | | | | |
| **Grand Total** | | | | |

## II. GUIDELINES ON WRITING THE ACTION RESEARCH REPORT

### A. Writing Style

The following list presents standards to observe as you draft your report.

1. **Paragraph**. Use plain and simple language as well as short words and brief sentences. Arrange sentences in logical order and join related ideas with appropriate transition words.
2. **Acronym**. Indicate what the letters stand for at the first occurrence in your report.

   *Example*: The Office crafted its second Division Education Development Plan (DEDP).
3. **Tense**. The Action Research report is written in past tense.
4. **Person**. Use of the first-person (I, we, our), second-person (you, yourself), and third-person (he, him, she) point of view in writing the report is acceptable. However, once you have chosen a point of view, you must use it consistently throughout a sentence or paragraph.
5. **In-text Citation**. Cite sources properly to avoid plagiarism issues. Use a consistent citation style. Below are some examples using the American Psychological Association (APA) format of in-text citation:
   a. Single author (book)—Provide the author's last name followed by a comma and the year of publication.

      *Example*: (McNiff, 2013)
   b. Two authors (book)—Use an ampersand (&) before the second author's last name followed by a comma and the year of publication.

      *Example*: (Herr & Anderson, 2014)
   c. Three to five authors (book)—Give all the authors' names the first time the citation occurs. Include only the last name of the first author followed by "et al." for subsequent citations.

      *Examples*:

      (Nugent, Malik, & Hollingsworth, 2012)

      (Nugent et al., 2012)
6. **References**. All sources cited in your report should appear in the *References* section. The entries must be arranged alphabetically by the last name of the first author. Works by the same authors are arranged in order of year of publication with the earliest one first.

# PRACTICE/EXERCISE

**A.** Match the incomplete statements in column A with the corresponding part of the Action Research report in column B by drawing lines.

| Column A | Column B |
|---|---|
| 1. "I learned that conducting an Action Research is challenging and…" | A. Abstract |
| 2. "The dropout rate in Negros Oriental" | B. Acknowledgment |
| 3. "ICT-based instruction will be applied…" | C. Action Plan |
| 4. "The research completion would not have been possible if not for the contribution of the following persons:" | D. Context and Rationale |
| 5. "List of Figures" | E. Financial Report |
| 6. "Fund utilization" | F. Innovation, Intervention, or Strategy |
| 7. "I will be presenting the results to…" | G. References |
| 8. "Table 1 shows the mean of dropout rate by gender" | H. Reflection |
| | I. Research Findings |
| | J. Research Methods |
| | K. Research Question |
| | L. Table of Contents |
| | M. Title Page |

**Note:** You may check your answers by looking at the *Answer Key* at the end of this section.

**B.** Following the guidelines and standards in writing the various parts of the Action Research report, begin to write your own particularly if you have already completed your study but have not yet started with the report. Use the attached worksheet for this purpose.

If you have not yet started or completed your Action Research, you may work on the *Context and Rationale* part and slowly move through the *Innovation*, *Research Question,* and *Research Methods*.

When you are done drafting all the main parts of the report, find a colleague who can read your work and give comments. Use the feedback in revising your draft.

**C.** For you to appreciate some more the value of Action Research and to obtain ideas on how to write its different parts, review the attached sample Action Research by Jane L. Hollis titled "Effect of Technology on Enthusiasm for Learning Science." Identify its various parts using the following matrix. Read the article first and try to understand what it is about before accomplishing the matrix. Take note that the point of this activity is NOT to complete the matrix by copying parts of the text but to complete it based on your understanding of the article.

| Context and rationale | Innovation/ intervention/ strategy | Research question/s | Research methods (Sample, Data Collection) | Research findings |
|---|---|---|---|---|
| | | | | |

# REFERENCES


Department of Education. 2017. Research Management Guidelines. DepEd Order 16, s. 2017.

XenPH. 2011. "Thesis: Preliminary Parts." Thesis Works (website). Accessed May 21, 2018. thesisworks.com/2011/thesis-guide/thesis-preliminary-parts/ Hollis, J. L. 1995. "Effect of Technology on Enthusiasm for Learning.

Hollis, J. L. 1995. "Effect of Technology on Enthusiasm for Learning Science." Indiana University Libraries Digital Projects & Services (website). Accessed May 21, 2018. http://webapp1.dlib.indiana.edu/virtual_disk_library/index.cgi/4273355/FID1736/curric/enc2432/2432_ch1.htm

Paiz, J., E. Angeli, J. Wagner, E. Lawrick, K. Moore, M. Anderson, L. Soderland, Brizee, A., & Keck, R. (2018, March 30). Reference list: Electronic sources (Web Publications). Retrieved from https://owl.english.purdue.edu/owl/resource/560/01/

Paiz, J., E. Angeli, J. Wagner, E. Lawrick, K. Moore, M. Anderson, L. Soderland, A. Brizee, and R. Keck. 2018. "In-text Citations: The Basics." Purdue University (website). Accessed May 21, 2018. https://owl.english.purdue.edu/owl/resource/560/02.

## SECTION 6.3

# TIPS IN WRITING AN ACTION RESEARCH REPORT

# OBJECTIVES

At the end of this section, the reader will be able to:

1. compose the initial draft of his or her Action Research proposal and Report and
2. assemble the Action Research proposal and report according to the sequence of parts.

# INTRODUCTION

When writing Action Research proposal and report, the researchers usually prepare, review, and edit several drafts. Regardless of the kind of research output, writing styleand document formatting are essential in revising before submission.

This section includes key concepts and exercises on writing style and document formatting to enhance the content and improve the appearance of your Action Research proposal and report.

# STEPS/KEY CONCEPTS

## A WRITING GUIDELINES

The following list presents standards to observe as you draft your Action Research proposal and report.

1. **Paragraph.** Use plain and simple language as well as short words and brief sentences. Arrange sentences in logical order and join related ideas with appropriate transition words.

2. **Acronym.** Indicate what the letters stand for at their first occurrence in your proposal or report.
   *Example*: The Office crafted its second Division Education Development Plan (DEDP).

3. **Tense.** The Action Research proposal is written in present and/or future tense while the completed Action Research report is written in past tense.

4. **Person.** Use of the first-person (I, we, our), second-person (you, yourself), and third-person (he, him, she) points of view in writing the proposal and report are acceptable. However, once you have chosen a point of view, you must use it consistently throughout a sentence or paragraph.

5. **In-text citation.** Cite sources properly to avoid plagiarism issues. Use a consistent citation style. . Below are some examples using the American Psychological Association (APA) format of in-text citation:
   a. Single author (book)—Provide the author's last name followed by a comma

and the year of publication.

*Example*: (McNiff, 2013)

b Two authors (book)—Use an ampersand (&) before the second author's last name followed by a comma and the year of publication.
*Example*: (Herr & Anderson, 2014)

c Three to five authors (book)—Give all the authors' names the first time the citation occurs. Include only the last name of the first author followed by "et al." for subsequent citations.
*Examples*:
(Nugent, Malik, & Hollingsworth, 2012)
(Nugent et al., 2012)

6 **References.** All sources cited within your proposal and report should appear in the *References* section. The entries must be arranged alphabetically according to the last name of the first author. Works by the same authors are arranged in order of year of publication with the earliest one first.

## PRACTICE/EXERCISE

A Review the citations you made in your Action Research proposal or report. Edit them to ensure that each one follows the consistent guidelines regarding the proper inclusion of authors' names, use of ampersand and *et al*., and provision of date ofpublication and page reference (if applicable).

B Get a copy of your draft and use the attached checklist on formatting an Action Research proposal and report to evaluate your work. After completing the checklist, go over your document and add the missing section or entry or revise those that are lacking.

## REFERENCES

Paiz, J., E. Angeli, J. Wagner, E. Lawrick, K. Moore, M. Anderson, L. Soderland, A. Brizee, and R. Keck. 2018. "Reference list: Electronic Sources (Web Publications)". Purdue University (webiste). Accessed May 21, 2018. https://owl.english.purdue.edu/owl/resource/560/01/.

Paiz, J., E. Angeli, J. Wagner, E. Lawrick, K. Moore, M. Anderson, L. Soderland, A. Brizee, and R. Keck. 2018. "In-text Citations: The Basics." Purdue University (website). Accessed May 21, 2018. https://owl.english.purdue.edu/owl/resource/560/02/.

## NOTES/SIDEBAR

**Tip:** The Research Management Guidelines of DepEd (DepEd Order No. 16, s. 2017) may also be referred to when revising the Action Research proposal. This is to ensure the alignment between the content and the evaluation criteria found on Annex 4B.