RESEARCH METHODS FOR EDUCATIONAL LEADERS

VUSSC

Research Methods for Educational Leaders
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Commonwealth of Learning
Edition 01

COMMONWEALTH of LEARNING

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ACKNOWLEDGEMENTS

The majority of this course was created using the following Commonwealth of Learning OER materials in accordance with the CCBY copyright guidelines.

Cred, C., Freeman, R. Robinson, B. & Woodley, A. (n.d.). Practitioner Research and Evaluation Skills Training in Open and Distance Learning: Module A1 – Dongin Education Research and Evaluation in ODL. Commonwealth of Learning, Vancouver, BC.

Cred, C., Freeman, R. Robinson, B. & Woodley, A. (n.d.). Practitioner Research and Evaluation Skills Training in Open and Distance Learning: Module A2 – Planning Research and Evaluation. Commonwealth of Learning, Vancouver, BC.

Cred, C., Freeman, R. Robinson, B. & Woodley, A. (n.d.). Practitioner Research and Evaluation Skills Training in Open and Distance Learning: Module A5 - Mixed Research Methods. Commonwealth of Learning, Vancouver, BC.

Cred, C., Freeman, R. Robinson, B. & Woodley, A. (n.d.). Practitioner Research and Evaluation Skills Training in Open and Distance Learning: Module A6 – Reporting on Research to Support or Influence Change. Commonwealth of Learning, Vancouver, BC.

The complete PREST series and supporting materials are available in the COL repository at:
http://www.col.org/resources/publications/Pages/detail.aspx?PID=347

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COURSE OVERVIEW

INTRODUCTION

Conducting educational research requires knowledge of the scientific process and a variety of research tools and techniques. What research you do, how you do it, and what happens to the results will depend to a large extent upon the social situation and educational environment you find yourself in. There will be many direct influences that relate to your own position as a researcher in the decision-making structure. As you progress through the course you will learn to consider your own personal values, and how to examine the education, economic, labour and other variables that impact your research process and findings.

COURSE GOALS

Upon completion of this course you as an educational leader will be able to:

1. Select an appropriate methodology to research educational and organizational issues.
2. Review and interpret research articles.
3. Apply the basic steps in the research process to investigate educational and organizational issues.
4. Explore qualitative methods including Action Research and their potential application in investigating educational and organizational problems.
5. Collect and analyse data to address a specific educational research question.
6. Develop a research proposal on an identified educational or organizational problem.
7. Conduct research to inform practice.

DESCRIPTION

This Research Methods course will provide educational leaders with the fundamental knowledge and skills required to carry out applied research in education. Specifically, the course will foster an understanding of the basic concepts of educational and organizational research, and the types of research that could be carried out to assess and evaluate the quality of the teaching and learning environment in an organization. The course will explore the steps involved in carrying our research, especially action research, as well as a discussion about how the findings of research could be applied to help improve system wide educational practices. The course also addresses how educational data can be

collected, analysed and used extensively to guide the formulation and implementation of policies and practice that support educational improvement.

SUGGESTED READINGS

A variety of readings are recommended in each study unit. In addition the following online materials are recommended:

Best, J.W. & Kahn, J.V. (1995). Educational Research. Seventh Edition. New Delhi, Prentice-Hall India. Available at: http://www.nimhindia.org/The%20meaning%20of%20research.pdf

Learners are also encouraged to download and review the entire COL PREST series on conducting research in Open and Distance Learning. It is available at: http://www.col.org/resources/publications/Pages/detail.aspx?PID=347

ASSIGNMENTS AND PROJECTS

A series of activities and assignments will guide you through the concepts in this course and ask you to demonstrate that you can apply the concepts to support the completion of a research proposal/project. A summary of this work is included at the beginning of each unit. The major assignment in this course is found at the end of the course, where you will develop a research proposal to study a specific issue within your school or district. Your institution / tutor will help you through this material and will also assign additional projects as required by the institution.

JOURNALING REQUIREMENTS

To capture the output from the reflective questions and activities you are asked to keep a personal journal. At the end of the course the personal journal will be submitted to your instructor for feedback and grading.

ASSESSMENT METHODS

Assessment takes the form of responding to activities, as well as written assignments and examinations as determined from time-time by the institution. In cases where coursework assignments, fieldwork projects, and examinations are used in combination, a percentage rating for each component will be communicated to you at the appropriate time.

TIME REQUIRED

This course is worth 14 credits, or a credit value assigned by your institution. Each credit is equivalent to 10 notional study hours. You are, therefore advised to spend a minimum of 140 hours of study time on the course. This notional time includes:

- completing activities embedded in the study material;
- maintaining your personal journal;
- peer group interaction (where necessary);
- face-to-face tutorials (where necessary);
- working on tutor-marked assignments;
- reading assignments, and
- preparation time for and sitting examinations (where that is a requirement.)

COURSE SCHEDULE

A course schedule with due dates and additional readings will be supplied to you by your institution.

STUDENT SUPPORT

Note: This section should be included in self-paced or paper-based courses that provide tutor/facilitator support and/or web and email support for the students.

ACADEMIC SUPPORT

<Insert the following information if relevant>

- How to contract a tutor/facilitator (Phone number, email, office hours, etc.).
- Background information about the tutor/facilitator if he/she does not change regularly. Alternatively provide a separate letter with the package describing your tutor/facilitator's background.
- Description of any resources that they may need to procure to complete the course (e.g. lab kits, etc.).
- How to access the library (either in person, by email or online).

HOW TO SUBMIT ASSIGNMENTS

<If the course requires that assignments be regularly graded, then insert a description of how and where to submit assignments. Also explain how the learners will receive feedback.>

TECHNICAL SUPPORT

<If the students must access content online or use email to submit assignments, then a technical support section is required. You need to include how to complete basic tasks and a phone number that they can call if they are having difficulty getting online>.

UNIT ONE – NATURE AND PURPOSE OF EDUCATIONAL RESEARCH

UNIT INTRODUCTION

Educational research refers to a variety of methods, in which individuals evaluate different aspects of education including but not limited to: "student learning, teaching methods, teacher training, and classroom dynamics".

Educational researchers have come to the consensus that, educational research must be conducted in a rigorous and systematic way, although what this implies is often debated. There are a variety of disciplines which are each present to some degree in educational research. These include psychology, sociology, anthropology, and philosophy. The overlap in disciplines creates a broad range from which methodology can be drawn. The findings of educational research also need to be interpreted within the context in which they were discovered as they may not be applicable in every time or place.

This unit will explore the foundations of educational research.

UNIT OBJECTIVES

Upon completion of this unit you will be able to:

1. Explain the concepts of research and evaluation in the context of education.
2. Think in a critical way about what research is, the range of activities it covers and why people do it.
3. Explore the importance of the social and political context in which educational research takes place.
4. Explore how these matters relate to you and your own work situation.

UNIT READINGS

As you complete this unit you are required to read the following chapters/articles:

Best, J.W. & Kahn, J.V. (1995). Chapter 1 – The Meaning of Research. In Educational Research. Seventh Edition. New Delhi, Prentice-Hall India. p. 3 – 31. Available at: http://www.nimhindia.org/The%20meaning%20of%20research.pdf

TOPIC 1.1 – WHY CONDUCT RESEARCH?

INTRODUCTION

It is important to be clear where you stand in relation to what you are going to research and how you are going to use your research findings. In considering educational research Alistair Morgan stated:

> *'How do we use the research finding? At one level, this could be regarded as feedback from the learners, which will subsequently influence course design and course improvement. This is the conventional systems approach to educational technology, which assumes that a teaching and learning system will have a rational feedback model, reacting and responding to feedback. Although this model may be attractive, in practice the real world is very different. Donald Schön (1983) is critical of what he calls the 'technical rationality', or the official scientific view of how professionals are supposed to act, as a totally inadequate description. He sets out a notion of 'reflection in action' as a more realistic model for understanding professional practice, which acknowledges judgement and the interpretation of research. Reflection-in-action implies that the practitioner becomes a 'researcher' of that practice, as he or she is required to make sense of and understand new situations. This requires the practitioner to be reflective, as a key to understanding unexpected and novel situations'*
>
> *(Morgan, 1993, p. 130)*

Schön (1983) acknowledges the complexity of professional practice and suggests that the way forward is to become a 'reflective practitioner' by constantly 'researching' that practice. During the completion of your educational leadership programme it will involve carrying out some actual research but it should also involve a great deal of introspection and discussion with colleagues. Doing practitioner researcher is not just about selecting a research tool,' turning the handle', cranking out the results and then making policy changes!

Before starting let's explore what is research.

OBJECTIVES

Upon completion of this topic you will be able to:

1. Define research.
2. Explain the difference between pure and applied research.
3. Examine different research topics applicable to educational leaders.

READINGS

As you complete this topic you should read the following sections of the course text:

Penn State University. (n.d.). What is Research? Web Page. Available at: http://www.personal.psu.edu/users/w/x/wxh139/research_talk.htm

DEFINING RESEARCH

The word 'research' is a general term suggesting a process of rigorous enquiry in the pursuit of knowledge. For the moment let's acknowledge that the verb 'to do research' is not quite as straight-forward or as self-explanatory as certain other verbs such as 'to drive a car' or 'to kick a football'. Let's move on to look at your underlying ideas, preconceptions and stereotypes concerning 'research'.

If you meet somebody who says that they are a police officer or a rocket scientist or a car mechanic, then you form a fairly accurate picture of what their job entails. However, if a person says that they do research, the image you conjure up may be vague or wildly inaccurate. This is because the term 'research' is used in a variety of both work and non-work situations. The following activity is designed to explore the different dimensions involved.

Activity – Defining Research

Read through the seven imaginary examples below. Some use the word research and others don't.

For each example, note down:

1. Whether or not you think that it involves research in terms of your favoured dictionary definition.
2. The reason for your answer.

Case Details	Is it research?	Why?/Why not?
1. I am thinking of buying a new bicycle, so I need to do a little research.		
2. The lab worker is testing blood samples to see which show signs of anaemia.		
3. The last time I baked some bread it did not rise. So this time I am trying a different batch of yeast.		

Case Details	Is it research?	Why?/Why not?
4. As the unit's administrator, I have gone through the records and noted that the amount of photocopying has gone down since staff has been using email, so I have decided to get rid of one of the copying machines. I will see what the records show next year.		
5. Professor Jones is in the library reading some journal articles.		
6. I have talked to a number of students on my course and women seem to find it more difficult than men. So now I try to give them extra support. I will see if it makes a difference.		
7. Professor Khan's journal article on distance education brings together evidence from numerous studies that she has carried out. She concludes that distance education is frequently just as expensive as face-to-face teaching.		

Record your responses in your course journal. Once you have made the entries into your journal than see the next page for feedback on this activity.

Feedback on Activity – Defining Research

Here are some thoughts on the seven cases. As you read the thoughts below you will realize that all could be classified as 'research' in the general sense.

Case	Thoughts on Each Case
1. I am thinking of buying a new bicycle, so I need to do a little research.	This is a very informal use of the term 'research'. It is clearly just one person who is finding out something for their own benefit. It requires little if any training. As for the research process, it might vary from contacting one to twenty shops to compare prices, or it might involve detailed investigations of gear ratios and tyre quality. The decision to buy might eventually come down to favourite colour.
2. The lab worker is testing blood samples to see which show signs of anaemia.	The white-coated lab-worker has many of the hallmarks of classic scientific 'research'. It is clearly a systematic investigation using appropriate equipment, rigorous procedures and a reporting strategy. However, the only 'new knowledge' is whether or not a particular sample is positive or negative. The whole process could probably be carried out by a machine. Maybe a more appropriate term would be 'testing 'or 'monitoring'.
3. The last time I baked some bread it did not rise. So this time I am trying a different batch of yeast.	While far less formal than the previous example, this is perhaps much closer to scientific research in that it represents an 'experiment'. Of all the variables that could be to blame, it is hypothesised that it is the yeast and a new one is being trialled. To be more 'systematic', and to learn faster, one might advise the cook to try a variety of yeasts on one batch of dough and under carefully controlled conditions. However, much of what passes for everyday knowledge has accumulated over the years from such 'informal experiments'.

Case	Thoughts on Each Case
4. As the unit's administrator, I have gone through the records and noted that the amount of photocopying has gone down since staff has been using email, so I have decided to get rid of one of the copying machines. I will see what the records show next year.	In many ways this is similar to the last example. It appears more formal in that it involves consulting written records and it is within a work environment. The administrator is investigating ways in which to save money. However, she is unlikely to see it as research. It is part of her job as an administrator.
5. Professor Jones is in the library reading some journal articles.	I would say that whether or not this is research depends upon what the professor is actually doing. If he is just catching up on the research literature then this activity is normally referred to as 'scholarship'. If he is reviewing the literature in order to decide the best way to construct his new study then this is 'background research'.
6. I have talked to a number of students on my course and women seem to find it more difficult than men. So now I try to give them extra support. I will see if it makes a difference.	Again a fairly informal approach. However, underlying the statement is a conventional research approach: observation, hypothesis, intervention, re-measurement.
7. Professor Khan's journal article on distance education brings together evidence from numerous studies that she has carried out. She concludes that distance education is frequently just as expensive as face-to-face teaching.	This has a lot of the characteristics of a classic piece of distance education research. Implicitly it tests out a hypothesis, (that 'distance education is less expensive than face-to-face education') by collecting and analysing empirical data on costs and student progress rates. It is disseminated in a reputable journal to colleagues working in the same field.

EDUCATIONAL RESEARCH

Wikipedia (2013) describes educational research as "a variety of methods, in which individuals evaluate different aspects of education including but not limited to: "student learning, teaching methods, teacher training, and classroom dynamics". Wikipedia continues:

> *Educational researchers have come to the consensus that, educational research must be conducted in a rigorous and systematic way, although what this implies is often debated. There are a variety of disciplines which are each present to some degree in educational research. These include psychology, sociology, anthropology, and philosophy. The overlap in disciplines creates a broad range from which methodology can be drawn. The findings of educational research also need to be interpreted within the context in which they were discovered as they may not be applicable in every time or place.*

WHY CONDUCT RESEARCH?

There are many books on **how** to do research but they tend to pay relatively little attention to the question of **why** we should do it. Let's reflect upon this for a moment by considering how some people might answer the question 'Why do you do research?'.

Western academics might be perplexed by this question because for them it would be self-evident. It would be like asking them 'Why breathe?'. If forced to answer, many would say that it is the very basis of their job. Some even see teaching as getting in the way of their duty to 'push back the boundaries of knowledge'.

Others might describe research as a necessity for survival. This is because research, when coupled with publication in a book or reputable journal, is an important activity that has a great bearing on their status and promotion opportunities. Some might say that they need to do research because it informs and improves their teaching. Others might mention natural curiosity or their own desire to learn.

So the question 'Why do research?' can be answered many different ways. The word 'why?' is so broad that answers can legitimately vary from 'in order to get promoted' to 'to increase the sum of knowledge'; from 'because I was told to' to 'in order to combat the AIDS pandemic'.

Why do educational research? The Ontario Ministry of Education (2013) attempted to answer this question. They describe their need to conduct research as follows:

> *"The ministry is committed to being evidence-based in the decisions we make, the policies we develop and the programs we implement. Good evidence includes the use of research and evaluation to inform our work. The ministry has an important role to play in developing, conducting, commissioning and communicating research connected to our priority goals.*

Unfortunately, good quality education research does not always find its way into the hands of teachers and teaching assistants who work in the classroom, or to those who formulate education policy. Yet, we know that research can inform more effective practices that can result in improved student outcomes. Evidence from research and evaluation can also help to ensure resources are invested wisely and our future programs learn from the strengths and weaknesses of past approaches. Independent evaluation evidence also contributes to improving public confidence in the results we are achieving."

PURE VS. APPLIED RESEARCH

'Pure' research tends to be associated with ideas and theories whereas 'applied' research is to do with action and practicalities. However, it is easier to give extreme examples than to provide precise definitions.

In a traditional science such as physics you might have 'pure' research into the basic structure of matter and 'applied' research into how to build a faster computer. In open and distance learning a 'pure' researcher might be looking at the history of peripatetic teachers in China in the Ming dynasty (I made that up) whereas an 'applied' researcher might be measuring the effects on student retention of assignment turnaround times.

The table below lists some of the characteristics that each type of research tends to have.

Table - Characteristics of pure and applied research

Pure Research	Applied Research
Developing theory	Using theory or can be atheoretical
No clear practical uses/policy relevance	Clear practical use/policy relevance
Driven by thoughts/ideas	Driven by data
Guided by intellectual curiosity	Guided by research commissioners
Open-ended	Has time and money constraints
Aimed at peer group	Aimed at decision-makers

Activity – Methods and Theories

Download and read the following articles. Consider the following and record your responses in your course journal.

1. What methods and theories are described in the research articles?

2. What are the similarities and differences in the research approach and methods?

Ritter, S., Anderson, J.R., Koedinger, K.R. & Corbett, A. (2007). Cognitive tutor: Applied research in mathematics education. Phsychonomic Bulletin & Review, 2007, 14(2), 249-255. Available at: http://act-r.psy.cmu.edu/papers/790/Ritter%20Anderson%20Koedinger%20Corbett%202007.pdf

Fiskum, T.A. & Jacobsen, K. (2012). Relation between the school environment and the children's behaviour. The Open Education Journal, 2012, 5, 39-51. Available at: http://www.benthamscience.com/open/toeduj/articles/V005/39TOEDUJ.pdf

WHY CONDUCT RESEARCH?

Your work and that of your institution will almost certainly provide a vast array of activities and processes that could be researched, evaluated and improved. At the end of this course, we will attempt to guide you towards a research project that you can carry out as you work through the later modules in this series.

Educational Research Categories

The nature of education and educational presentations allows research to be grouped by specific categories.

By 'course' we mean a piece of traditional, blended or distance learning that it is self-contained. A learner enrols on it, studies it, and is perhaps assessed on it. For example, a researcher could be asked to evaluate a course like 'Introduction to Psychology' that is taken by many first year social science students. The aim of the research is to improve the quality of the course and its impact on learners.

A 'programme' means an array of related and linked courses provided by an institution that leads to a particular outcome or qualification. For example, if individuals take a particular set of educational technology courses this programme will lead to a Masters in Education with a speciality in Educational Technology. The research could investigate whether the graduates of the programme were adequately prepared for a career as educational technologist.

A 'system' refers to a whole providing institution or organisation.. For example a researcher could explore the efficiency of different sub-systems within the university. For example is the registration system providing appropriate data to support the programme coordinators and their planning for current and future course offerings? Or are the social networking tools provided by the IT department sufficient to support learners, faculty and staff in establishing and growing education communities?

In reality there is considerable over-lap in the above examples. Some techniques, such as statistical tables and data analysis, are used at all levels of educational research.

SOME EDUCATIONAL RESEARCH IDEAS

The University of Illinois at Ubana-Chamaign College of Education posted an extensive list of suggested applied research topics that could be conducted by school administrators and teachers (Bureau of Educational Research, 2013). Hopefully the list below will give you some ideas for your own research.

Behaviour

- The effectiveness of behaviour and discipline systems for diverse groups.
- The character education.
- Impact of specific classroom behaviours on student grades (and vice versa?).
- Starting with younger children and tracking children's educational progress over a number years.
- What are some of the psychological issues that may be going on with children that are impacting behaviour and contributing to discipline problems?
- Attendance and its relationship to learning and behaviour.
- Bullying, intimidation, harassment, humiliation, during secondary school and the transition in high school.
- Racial interactions and tensions related to education and behaviour.
- Emotional, behavioural or mental health issues that impact secondary students and their educational success.
- Student engagement with school.

New Choices

- Gifted Education and Accelerated Programs.
- Alternative schools.
- Transferable models of successful, small urban schools.
- Summer bridge programs.
- After school academic intervention and enrichment programs.
- Overall student health including physical health and socio-emotional well-being.
- Parental involvement and full service community schools
- Addressing the full spectrum of issues preventing their child's school success e.g. homelessness.
- Mapping current services that either are in the school system, community, or are linked to the system.
- Working with the most 'at-risk' or 'vulnerable' populations particularly those with young children.
- Family/ Parent impact on their child’s literacy.

Curriculum Issues

- Vertical teaming K-12 alignment of curriculum or possibly P-16 beginning with math.
- Early intervention - particularly with vulnerable populations**.**
- Foreign language including dual language program and immersion programs. How would a dual-language program impact students who may not be proficient in either their maternal language or English?
- Required reading programs in 6, 7, 8 - what are the alternatives? What is the documented value?
- Well defined models of support for struggling adolescent readers.
- Reading instruction for special education students
- Evaluation of math programs at the elementary level and effectiveness of preparation for the next level.
- Summer enrichment programs in mathematics.
- Evaluation of instruction, curriculum, and programs.

Staff Development and Training

- Teaming at the middle school level - productive use of time, team meetings, and planning time.
- Effective methods for staff training.
- Success of training modules.
- Looking at 3-4 year benchmarks of productivity.
- Staff training of excellent teaching methodology (lesson planning and lesson structure).
- Training teachers to be good administrators, researchers etc.

SUMMARY

In this topic we explored what research is and what type of research is conducted in support of the educational system. We must seek ways of improving our public education system through the conduct and application of research findings. As we move through this course you learn how to organize and conduct a valid and reliable research study.

REFERENCES

Below is a list of articles/books referenced in this topic.

Bureau of Educational Research. (2013). School research ideas. College of Education, University of Illinois at Urbana-Champaign. Available at: http://education.illinois.edu/ber/school_research_ideas

Morgan, A. (1990). Whatever happened to the silent revolution in research theory and practice in open and distance education. In T. Evans (ed.). *Research in distance education 1,* Geelong: Deakin University Press.

Ontario Ministry of Education. (2013). Research in education. Available at: http://www.edu.gov.on.ca/eng/research/strategy.html#2

Schön, D. (1983). The reflective practitioner: how professionals think in action. London: Temple Smith.

Wikipedia. (2013). Educational research. Available at: http://en.wikipedia.org/wiki/Educational_research

TOPIC 1.2 – RESEARCH OR EVALUATION?

INTRODUCTION

The title of this topic contains the words 'research' and 'evaluation'. This implies that the two concepts are different and distinct. But this may not be the case. In the last topic you spent some time considering what research is but what about 'evaluation'? In this topic we will explore what evaluation is and how the two concepts impact the education system.

OBJECTIVES

Upon completion of this lesson you will be able to:

1. Define evaluation.
2. Explore the similarities and differences between research and evaluation.
3. Examine different types of evaluation.

READINGS

As you complete this topic you should read the following sections of the course text:

Zint, M. (n.d.). Evaluation: What is it and why do it? University of Michigan, School of Education. Web Site. Available at: http://meera.snre.umich.edu/plan-an-evaluation/evaluation-what-it-and-why-do-it

EVALUATION - DEFINED

A common definition of evaluation is 'the systematic investigation of the worth or merit of some object'. But in some cultures 'evaluation' is the term used for the process of grading students i.e. determining which students have done better than others. In these modules, we refer to that process as 'student assessment'. Both views have merit in the education system.

Considering how to use evaluation in an educational environment Wikipedia (2013B) notes that:

> *There are two common purposes in educational evaluation which are, at times, in conflict with one another. Educational institutions usually require evaluation data to demonstrate effectiveness to funders and other stakeholders, and to provide a measure of performance for marketing purposes. Educational evaluation is also a professional activity that individual educators need to undertake if they intend to continuously review and enhance the learning they are endeavouring to facilitate.*

There are several different types of educational evaluation.

- Personnel or teacher evaluation.
- Programme or course evaluation.
- Student evaluation.
- System or school performance evaluation.

EVALUATION AS RESEARCH

Evaluation as a form of research occurs in all disciplines and professions. In education formal school and system evaluation methods became popular in the 1950s and 1960s when governments invested large amounts of money in innovatory educational campaigns. These took place both in developed countries, where they attempted to eradicate poverty through literacy and supplementary school programmes (such as Head Start) and in developing countries as an attempt to boost national economic development. The research questions were plain. Do the campaigns work? i.e. How much learning took place? Are they cost-effective? i.e. What is the relative cost of the learning gains that were achieved? Evaluation was carried out by the government or its agents acting as 'neutral', objective outsiders. In fact these questions are really applied research questions.

Such types of evaluation are still carried out today, and you may well be asked to conduct them. However, 'evaluation' has taken on a much broader meaning within ODL. We have talked about applied research aiming to affect policy decisions and to improve practice. Well, evaluation when carried out within an institution has almost identical aims. Judith Calder starts her book with a very homely, commonsensical reminder of what it is all about:

> *'Think about the last time that you considered the need to make some sort of change. Before choosing a particular course of action, you would have reviewed the available options, or at least the options you knew about. You would have assessed how well each option might meet your needs, and at what cost. You would then have weighed up the advantages and disadvantages associated with each of the options before making your decision.*
>
> *The process of evaluation which we employ to reach a decision as to the way forward is the same regardless of the area of concern or its source or even of its importance. The care we take, the methods we use and the amount of attention we give to the process in those different situations is another matter.'*
>
> *(Calder, 1995, p. 15)*

So evaluation can be forward-looking – 'What shall we do?' – as well as backward-looking – 'Is what we have done that is worthwhile?' I would also add that evaluation can be about 'no change'. Research may show that all of the proposed changes will have negative results.

Also research can actually be commissioned to buy time! When confronted by a difficult situation, policy makers may say that 'We are doing research into that', thus delaying a decision.

To summarize 'evaluation' is applied research, it is about evidence-based decision-making and it is about which choice or change to make. Until now evaluation was about an individual making choices, but now you need to start thinking about evaluation as part of the processes of a complex system such as an organisation or a society.

TYPES OF EVALUATION RESEARCH

The list below represents some major areas of evaluation and research.

System evaluation Basic measures of activity.
Measures of efficiency
Evaluating student outcomes *In comparison with other teaching methods* *In cases where there is no assessment* *Following up successful students* *Other, unplanned, outcomes*
Overall system aims
Policy evaluation Market research
Surveys on policy options
Monitoring
The impact of policy changes
Experiments of pilot schemes
Organizational evaluation
Programme evaluation Measuring the impact of qualifications gained

Course evaluation How do you know what to change?
How do you know what to change in ODL?
Formative evaluation *Critical commenting* *Developmental testing* *Knowing your student*
Summative evaluation *Feedback from tutors* *Feedback from students* *Extent of utilization* *Overall view of the teaching* *General style of presentation* *Specific content issues*
Cross-sectional studies
Developmental studies

EVIDENCE-BASED DECISION MAKING

In this unit we have talked about evaluation as being associated with evidence-based decision making. However, I do not want to suggest that we are heading for an objective, rational decision-making model in which research leads you to a unique solution that guarantees increased 'profits' or 'student retention'. (In fact there is a lot of evidence to suggest that such a decision-making model does not exist in industry either.) Evaluation rarely has a clear and direct link to evidence-based decision making, for a number of reasons.

Firstly evaluation tends to be carried out in complex social and educational settings, using imprecise tools. It will be relatively rare that the research provides clear, precise, unambiguous findings that point towards a single course of action.

Secondly, we have not yet considered the context in which this decision-making takes place. There are frequently several interested parties – often referred to as 'stakeholders'. These may include government officials, funding agencies, administrators, teachers and the learners themselves. They are likely to have different views on the desired outcomes of a particular project and the relative worth attached to these outcomes.

An institution itself might have conflicting aims. For example, research findings that indicate how participation of learners with a poor educational background might clash with targets to increase retention rates.

An institution may choose to ignore research findings for 'political' reasons. For example, research might show very little demand for a proposed course but the institution might decide to go ahead for it because they must be seen to offering it for reasons of status.

So, to be more precise, we should perhaps say that evaluation aims to **improve** evidence-based decision-making.

SYSTEM EVALUATION

Any rigorous system of evaluation must begin with certain basic data such as:

- How many courses have been produced?
- How many students are there?
- How many applicants had to be turned away?

This data should be drawn from administrative records and be presented regularly, sometimes as part of an institution's annual report or separately as a volume of statistical tables.

We have called these 'measures of activity'. The information involved has to be collected routinely by the teachers or the teaching institution; it must be stored safely over time and it must be easily accessible to those who need it and who are entitled to have it. (McIntosh, Woodley and Morrison, 1980).

If you work in a situation where there are only one or two courses and quite small student populations, such matters might not seem to concern you directly. However, no matter how small the numbers, the principles of statistical presentation are the same.

Whatever your practitioner role is, you will be faced by statistical tables. Used properly they are excellent ways of summarising large amounts of numerical data in ways to allow you to see 'the bigger picture'. You may have to construct them, or interpret them, or both. The skill of creating and presenting tables is covered in later modules in this course.

EVALUATING STUDENT OUTCOMES

In most educational systems the measurement of whether adequate learning has taken place, and whether some students performed better than others, has usually been left to the formal exams and assessment system. However, there are a number of ways in which research has attempted to follow-up the teaching to see what impact the teaching and learning experience has had upon students, their family, their community and even on society in general.

Some courses require little or no formal evaluation. These tend to be courses aimed at groups who have little prior experience of education, for whom assessment might be seen as threatening (for example, basic literacy courses); life skills courses (for example, the care of babies); or leisure courses (for example, music appreciation).

In these cases the researcher is often required to carry out follow-up studies to see whether there have been appropriate changes in behaviour or attitudes. For example, in one study at the OUUK people who had bought a study pack on energy-saving in the home were contacted several months later to see whether they had carried out the energy-efficiency measures that had been specifically recommended (in the UK this might involve insulating their roofs or double-glazing their windows against the cold) and whether their fuel bills had gone down. In another study, young mothers from deprived inner-city areas in Glasgow who had taken short community courses were followed up to see what impact the courses had had on their lives and those of their children (Farnes, 1988). No formal assessment was administered during the conduct of these courses. Evaluation surveys were mailed to the participants after a specific amount of time.

EVALUATING GRADUATES

The 'outcome' does not necessarily end when a student gains a qualification from an educational institution. There may be concerns about whether the qualification is seen as valid in the wider society, whether the student goes on to use it to improve their career, etc.

Mail surveys of OUUK graduates have been carried out to measure the long-term outcomes for individuals following an extended period of successful OU study (Swift, 1982; Woodley, 1988). These studies have looked at occupational outcomes such as:

- Was the student studying for vocational reasons?
- What changes have occurred in the student's employment status and income?
- To what extent were these due to their formal studies?
- What barriers have they faced when trying to improve their careers?
- Do would-be employers value the qualifications they have gained?

They have also looked at educational outcomes such as:

- Have the students been accepted for further study at other educational institutions?
- Have students been able to use their qualifications to gain admission to professional bodies?
- Have their qualifications been accepted as being on a par with those gained through face-to-face study?

And on a personal level:

- Has the course led to a growth in affective dimensions such as self-confidence?
- Has the course improved cognitive skills such as the ability to synthesise data from several sources?
- Has the course led to better social skills such as leadership or the ability to communicate with others?

POLICY EVALUATION

While all of the research we have considered so far is related to policy making, here I am talking about a more direct link.

Some research in the policy area can be termed 'formative evaluation'. This is where the institution is considering taking some action but is using research in an attempt to take a better-informed decision.

Policy evaluation has also taken the form of monitoring. The OUUK carries out regular surveys to monitor the financial impact of study on its students, thus gauging the effects of fee increases, changes in levels of assistance from employers, the effects of the University's own financial assistance schemes, etc. (Blacklock, 1982). Other survey data on the ownership of televisions, cassette recorders, home computers, etc., can assist course design and planning (Grundin, 1983; Kirkwood, 1997).

Research has also been used to evaluate the impact of policy changes. In one study, researchers looked at the effects of a OUUK policy to 'de-register' undergraduates who had made no progress with their studies over a number of years (Heron, *et al*, 1986). The results showed that one unforeseen consequence of this policy was that the University had de-registered many of its own graduates! These were people who had gained Ordinary Degrees but who were going for a good Honours degree. If the students thought that they were not going to gain a good final grade, they were withdrawing from their courses.

Finally, policy evaluation studies have also taken the form of experiments or pilot schemes. One of the best-documented involved the admission of younger students to the OUUK in the 1970s. The University had set its minimum entry age at 21 but the Government saw the University as a way to expand opportunities for school-leavers. It was agreed that limited numbers of younger students would be admitted on a trial basis and the outcome evaluated over several years before making a final decision (Woodley and McIntosh, 1980).

The outcome of this research is instructive for researchers. By the time the longitudinal study had been completed, there had been a change of government and the pressure to take school-leavers had been removed. It is also noteworthy that the University voluntarily reduced the age limit to 18 when faced with declining applications from the older age groups. In the last few years the number of students aged fewer than 21 has increased rapidly, ostensibly because of increased fees and debts in conventional universities.

ORGANISATIONAL EVALUATION

Just like any other large and complex organisation, universities, colleges and even schools can and have been evaluated in terms of their internal operations and procedures. Are they being run efficiently? Could they be run better? Some of these evaluation activities go beyond the scope of the generalist researcher and require specialist professional skills. They include investigating:

- standards of general management within the institution, including consultation and communication at all levels;
- financial management;
- 'organisation and methods' procedures for course production;
- Are teams an efficient way to produce courses? and/or
- Are the course materials delivered to students on time?

PROGRAMME EVALUATION

Programme evaluation sits in between system and course evaluation. It draws on ideas and techniques from both. I will just comment briefly on one or two aspects where it differs from them.

A lot of practitioner research in education consists of the measurement of student progress rates. This is a complex issue and it is taken up in detail in the handbook on programme evaluation in this series. In the case of a single course, there are different ways of deciding the student's status on the course, as Table 5 shows.

The table below describes different ways of deciding a student's status on a course

Research Issue	Possible Measures
Have they actually joined the course?	Have they registered? Have they paid the fee? Have they sent in their first assignment?
Are they still on the course?	Have they formally withdrawn? Are they still attending teaching sessions? Are they still submitting assignments?
Have they been successful?	Did they study all the material? Did they pass the continuous assessment? Did they sit the final exam?

When a student is registered in a programme of study, then the difficulties multiply. Not only do you have to look at progress on individual courses, you also have to assess which of the successful courses count towards which, if any, of the programmes the students is registered for.

If a student has successfully completed a programme of study that leads to a specific qualification, such as a Certificate in Pharmacy or a Diploma in Accounting, then any follow-up study should focus on measuring occupational outcomes that are likely to arise from that particular qualification. However, there are problems when trying to prove whether a given outcome arose directly from that qualification. Many students, and particularly mature students, have skills and experience prior to the course. Therefore it is a good idea to try to draw a comparison group from the general population of people with similar backgrounds but who have gained some other qualification or none at all. If this is not possible you should ask the student directly. They are often good judges when it comes to knowing the critical factor that got them their new job.

Another problem concerns time. In principle it is a good idea to allow a reasonable amount of time to elapse so that the people have a chance to try to use their qualifications in the job market. However, if you leave it too long, they may gain another qualification which may actually be the key factor in their success. Also, the longer you leave it, the more likely they are to have moved away and so they won't receive your survey!

In the next section we move on to course evaluation, much of which involves asking students for their opinions. When we are looking at whole programmes such evaluations

can be extended to ask students about the total learning experience, about linkages between courses and about the order in which courses should be taken.

COURSE EVALUATION

How do you know what to change?

I shall start with an example from classroom teaching. Imagine that you are a teacher in a classroom. You have prepared a lesson on food hygiene, say. You have written a few notes to remind you of the main points and you talk about the subject for 30 minutes. Occasionally you draw something on the blackboard. You notice that most of the students are taking notes, some seem bored and one appears to be asleep. When you ask if there are any questions it is the usual bright girl who puts her hand up. In the end of term exam, everybody avoids the question on food hygiene.

Now go forward to the following year. It is time to give the food hygiene lesson again. Do you just blow the dust off last year's notes and teach the same lesson again, or do you try to improve the lesson? How do you know what to change? If you change it, how do you know that you have improved it?

Now, you might say that as a talented, conscientious teacher you would probably have been carrying out a process of self-evaluation either consciously as a 'reflective practitioner', or subconsciously, just as any other good performer or artist might do. You may even have talked to the previous students to see what had gone wrong.

SUMMARY

After completing this topic you should now realize that evaluation is a type of practical research that helps educational leaders make appropriate decisions and changes to their learning environments. The aim of evaluation is to improve education through decision making research. Therefore evaluation is a major tool in an administrator's back pack and should be used to investigate a wide variety of issues facing the effectiveness and efficiency of an education system.

REFERENCES

Blacklock, S. 1982 'What the OU cost the undergraduate student in 1981', *Survey Research Department Paper 229*, Milton Keynes: The Open University

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Farnes, N. 1988 'Open University Community Education: emancipation or domestication'*, Open Learning* 3, 1: 35-40.

Grundin, H. 1983 'Audio-visual media in the Open University', *IET Papers on Broadcasting 224*, Milton Keynes: The Open University

Heron, M. et al. 1986 'Student progress and non-progress', *Regional Research and Development Papers 15*, Milton Keynes: The Open University

Kirkwood, A. 1997 'Computing access survey 1996', *PLUM Papers 80-83*, Milton Keynes: Institute of Educational Technology, The Open University.

Woodley, A. and McIntosh, N. 1980 The door stood open: an evaluation of The Open University younger students pilot scheme, Lewes: The Falmer Press.

UNIT SUMMARY

SUMMARY

In this unit we explored what research is and its importance to the education system. We examined the impact educational research could have and the many of the questions that need to be explored. We examined in some detail the use of evaluation as a research strategy and the different types of evaluation methods that could be used educational researchers.

ASSIGNMENTS AND ACTIVITIES

Produce a paper that explores at least three problems within your educational environment that needs some form of research. Describe the problem and its implications to your educational system. Create one or more research questions that could be explored as part of an evaluation study. Identify the type of evaluation study that should be used to examine your questions.

Once you have completed this assignment than submit your paper to your instructor for review, feedback and grading.

UNIT TWO – APPROACHES TO EDUCATIONAL RESEARCH

UNIT INTRODUCTION

While we have broadened out the term research to cover a range of activities and purposes, we have tended to treat it as a homogenous whole when it comes to actually carrying it out. However, within the field of research there is a range of methods, sometimes based on fundamental differences about what constitutes 'reality' and how we can 'know' anything. In this unit we present a brief introduction to the approaches that have been adopted in support of educational research.

UNIT OBJECTIVES

Upon completion of this unit you will be able to:

1 Distinguish between certain basic research approaches.

2 List their advantages and disadvantages.

3 Discuss when it is appropriate to use multiple research methods to examine specific research questions.

UNIT READINGS

As you complete this unit you are required to read the following chapters/articles:

Best, J.W. & Kahn, J.V. (1995). Part Two – Research Methods. In Educational Research. Seventh Edition. New Delhi, Prentice-Hall India. p. 81 – 207. Available at: http://www.nimhindia.org/The%20meaning%20of%20research.pdf

TOPIC 2.1 – QUALITATIVE VS. QUANTITATIVE RESEARCH

INTRODUCTION

As you begin planning your research effort you must decide what type of research you will collect. Research types are driven by the methods used to gather data, the types of data you collect and how you manipulate and analyse the data. In this topic we will begin to explore the different approaches to research and their supporting concepts.

OBJECTIVES

Upon completion of this lesson you will be able to:

1. Describe the role of theory in research.
2. Examine key concepts used in research.
3. Explain the similarities and differences of qualitative vs. quantitative research.

ACKNOWLEDGEMENT

The majority of this topic has been extracted from articles in Wikipedia.

1. Quantitative Research. (n.d.). In Wikipedia. Retrieved June 18, 2013, from http://en.wikipedia.org/wiki/Quantitative_research

2. Qualitative Research. (n.d.). In Wikipedia. Retrieved June 18, 2013, from http://en.wikipedia.org/wiki/Qualitative_research

THEORIES AND RESEARCH

Before we can explore the two major categories of research, educational leaders must first understand how their research questions are impacted by theory or how they result in theory. Driscoll (2005) states a "theory about learning is a set of laws or principles about learning". She goes to ask "But what do these principles involve? What is their purpose? and Where do they come from?"

Driscoll goes on to say,

> *"regardless of how questions arise, they generally lead researchers to conduct systematic observations on the basis of which plausible answers can be constructed. In some kinds of investigations, these observations are conducted without many advance or a priori expectations about what will be seen ……. Bu contrast other kinds of investigations require the researchers to generate and test potential answers to the research questions." p. 3*

These potential answers are governed by hypothesis about the different events or variables acting upon the observed event. Driscoll continues to say "in order to examine the viability of hypothesis a set of particular observations must be conducted".

This requires clearly defined methods of observing, collecting data, analysing data and measuring the results. Two major types of research exist to examine educational questions depending on the types of questions you ask, the hypothesis that you have proposed and the methods of analysing the data: Quantitative and Qualitative Research.

Before we jump into our discussion re: the two types of research let's examine a few definitions.

- **Theory** – is a set of interrelated constructs or concepts, definitions and propositions that presents a systematic view of phenomena by specifying relations among variables. A theory is used to explain or predict phenomena and can be tested for validity and reliability. A theory that is proven often involves into one or models.

- **Hypothesis** – a statement used to help clarify the research question. It is presented as a declarative statement of prediction and is in the form of either a null hypothesis or a directional hypothesis. The null hypothesis predicts no change or no difference. The directional hypothesis predicts a difference and the direction of that difference. Statistical methods are used to measure the hypothesis.

- **Variables** – in research are something that can be measured or observed upon to determine its impact on the hypothesis. Variables can include such things gender, age, education, weight, geographic location, motivation, economic status and other factors impacting on those groups being observed or measured.

- **Models** – are paradigms that describe the overall framework that is based on theory and is used to look at the situation being researched. Models consist of concepts and principles that have proven valid and help impose meaning on the world being observed. Models help classify and predict actions.

QUANTITATIVE RESEARCH

Quantitative research refers to the systematic and empirical investigation of social and educational phenomena using statistical, mathematical or computational techniques. The objective of quantitative research is to develop and validate mathematical models, theories and/or hypotheses pertaining to phenomena. The process of statistical measurement is central to quantitative research because it provides the fundamental connection between empirical observation and mathematical expression of quantitative relationships.

Quantitative data is any data that is presented in numerical form such as statistics, percentages, etc. for the purpose of comparison or analysis. In layman's terms, this means that the quantitative researcher asks a specific, narrow question and collects a sample of numerical data from participants to answer the question. Some examples of the numerical data could include: time, age, distance, gender, test results, etc.

The researcher analyses the data with the help of statistical methods. The researcher is uses the statistical output to examine different groups to yield an unbiased finding that can be generalized to larger populations. More generally, quantitative research is widely used in social sciences such as psychology, economics, sociology, marketing, education and political science, while it is conducted less frequently in domains such as anthropology and history. Research in mathematical sciences such as physics is also 'quantitative' by definition, though this use of the term differs in context. In the social sciences, the term relates to empirical methods, originating in both philosophical positivism and the history of statistics, which contrast with qualitative research methods.

Quantitative research is conducted using scientific methods, which can include:

1. The generation of models, theories and hypotheses.
2. The development of instruments and methods for measurement of a specific population.
3. Experimental control and manipulation of variables to compare populations.
4. Collection of empirical data for modelling and analysis.

COLLECTING AND MEASURING QUANTITATIVE DATA

Statistics is the most widely used branch of mathematics in quantitative research. Statistical methods are used extensively within fields such as economics, social sciences, education and biology. Quantitative research using statistical methods starts with the collection of data, based on the hypothesis or theory. Data collection requires verification, validation and recording before the analysis of the output can take place. Software packages such as SPSS and R (programming tools for data input and analysis) are typically used for this purpose.

Causal relationships of the data are studied by manipulating factors (or variables) thought to influence the phenomena of interest while controlling the impact of other variables relevant to the experimental outcomes. In the field of health, for example, researchers might measure and study the relationship between dietary intake and measurable physiological effects such as weight loss, controlling for other key variables such as exercise.

Quantitative opinion surveys (such as political polls) are widely used in the media, with statistics such as the proportion of respondents in favour of or against a specific position. In opinion surveys, respondents are asked a set of structured questions and their responses are tabulated. In the field of climate science, researchers compile and compare statistics such as temperature or atmospheric concentrations of carbon dioxide.

Empirical relationships and associations are also frequently studied by using some form of general linear model, non-linear model, or by using factor analysis. A fundamental principle in quantitative research is that correlation does not imply causation, although some such as

Clive Granger suggest that a series of correlations can imply a degree of causality. This principle follows from the fact that it is always possible a spurious relationship exists for variables between which covariance is found in some degree. Associations may be examined between any combination of continuous and categorical variables using methods of statistics.

Views regarding the role of measurement in quantitative research are somewhat divergent. Measurement is often regarded as being only a means by which observations are expressed numerically in order to investigate causal relations or associations. However, it has been argued that measurement often plays a more important role in quantitative research.[6] For example, Kuhn argued that within quantitative research, the results that are shown can prove to be strange. This is because accepting a theory based on results of quantitative data could prove to be a natural phenomenon. He argued that such abnormalities are interesting when done during the process of obtaining data, as seen below:

When measurement departs from theory, it is likely to yield mere numbers, and their very neutrality makes them particularly sterile as a source of remedial suggestions. But numbers register the departure from theory with an authority and finesse that no qualitative technique can duplicate, and that departure is often enough to start a search (Kuhn, 1961, p. 180).

In classical physics, the theory and definitions which underpin measurement are generally deterministic in nature. In contrast, probabilistic measurement models known as the Rasch model and Item response theory models are generally employed in the social sciences. Psychometrics is the field of study concerned with the theory and technique for measuring social and psychological attributes and phenomena. This field is central to much quantitative research that is undertaken within the social sciences.

Quantitative research may involve the use of *proxies* as stand-ins for other quantities that cannot be directly measured. Tree-ring width, for example, is considered a reliable proxy of ambient environmental conditions such as the warmth of growing seasons or amount of rainfall. Although scientists cannot directly measure the temperature of past years, tree-ring width and other climate proxies have been used to provide a semi-quantitative record of average temperature in the Northern Hemisphere back to 1000 A.D. When used in this way, the proxy record (tree ring width, say) only reconstructs a certain amount of the variance of the original record. The proxy may be calibrated (for example, during the period of the instrumental record) to determine how much variation is captured, including whether both short and long term variation is revealed. In the case of tree-ring width, different species in different places may show more or less sensitivity to, say, rainfall or temperature: when reconstructing a temperature record there is considerable skill in selecting proxies that are well correlated with the desired variable.

QUANTITATIVE RESEARCH METHODS

Below are some recommended materials/textbooks that describe quantitative research methods.

Saylor.org. (n.d.). BUS204: Business Statistics. Available at: http://www.oercommons.org/courses/quantitative-analysis-2/view

Vogi, W.P. (2006). Quantitative Research for Professionals. Pearson Publishing.

QUALITATIVE RESEARCH

Qualitative research, on the other hand, asks broad questions and collects verbal or observational data from the group or activity under study. When conducting qualitative research the researcher describes the information they collect into themes and patterns exclusive to that set of participants. Qualitative methods produce information only on the particular cases or subjects being studied. Qualitative research methods do not allow any more general conclusions and thus are only hypotheses. Quantitative methods can be used to verify which of such hypotheses are true.

Whereas quantitative research has its roots in the natural sciences, the qualitative approach draws more on anthropology and uses a variety of 'qualitative' methods. Qualitative research methods include:

Qualitative research is a method of inquiry employed in many different academic disciplines, traditionally in the social science and education, but it also used in market research, business analysis and other day to day venues. Qualitative researchers aim to gather an in-depth understanding of human behaviour and the reasons that govern such behaviour. The qualitative method investigates the *why* and *how* of decision making, not just *what*, *where*, *when*. Hence, smaller but focused samples are more often needed than large samples.

In the conventional view, qualitative methods produce information only on a particular case or situation, and any general conclusions are only propositions (informed assertions). Some typical approaches to qualitative research may include some or all of the following:

- **Observation**: The researcher spends time in a real-life situation watching and listening to it, trying not to affect it by being there.
- **Participant observation**: In this case the observer pretends to be one of the people in the situation and does not disclose that they are a researcher. They will alter the reality that they are observing, but not in the same way that a declared researcher would.
- **One-to-one interviews**: The researcher tries to gain information from a single person by asking them questions about their feelings, attitudes, behaviour, etc.

- **Group interviews/focus groups**: Here the researcher talks to several people at once, possibly asking the same questions to everybody or possibly listening to a more general discussion on given topics.
- **Analysis of documents**: In some cases the researcher might have access to diaries, legal documents, histories, the minutes of meetings, etc. that can shed light on the phenomenon in question.

The major benefit of qualitative research is that, if the researchers do their job well, then they can describe what is really going on in a community when an educational innovation is introduced. For example a researcher might explore when distant learning materials are introduced into a traditional student population, he/she might observe the teaching and learning process and its consequences:

1. Who was chosen as a student and why?
2. Did they retain the expertise or did they pass it on to others?
3. Did they seem to have grasped the general ideas from the teaching materials, or was it distorted?
4. Was the knowledge implemented at all? If not where did the breakdown occur and why?
5. Were the new methods adopted instead of, or in parallel to, traditional methods?
6. Did the farmers consider the process a success in their terms?
7. Would they be carrying on with it?

QUALITATIVE DATA COLLECTION

Qualitative researchers face many choices related to data collection ranging from grounded theory practice, narratology, storytelling, classical ethnography, or shadowing. Qualitative methods are also loosely present in other methodological approaches, such as action research or actor-network theory. Forms of the data collected can include interviews and group discussions, observation and reflection field notes, various texts, pictures, and other materials.

Qualitative research often categorizes data into patterns as the primary basis for organizing and reporting results. Qualitative researchers typically rely on the following methods for gathering information: *Participant Observation, Non-participant Observation, Field Notes, Reflexive Journals, Structured Interview, Semi-structured Interview, Unstructured Interview, and Analysis of documents and materials*.

The ways of participating and observing can vary widely from setting to setting. Participant observation is a strategy of reflexive learning, not a single method of observing. In

participant observation researchers typically become members of a culture, group, or setting, and adopt roles to conform to that setting. In doing so, the aim is for the researcher to gain a closer insight into the culture's practices, motivations and emotions. It is argued that the researchers' ability to understand the experiences of the culture may be inhibited if they observe without participating.

Some distinctive qualitative methods are the use of focus groups and key informant interviews. The focus group technique involves a moderator facilitating a small group discussion between selected individuals on a particular topic. This is a particularly popular method in market research and testing new initiatives with users/teachers.

There are several different research approaches, or research designs, that qualitative researchers use. In the academic social sciences, the most frequently used qualitative research approaches include the following:

Basic/generic/pragmatic qualitative research, which involves using an eclectic approach taken up to best match the research question at hand.

- Ethnographic Research, used for investigating cultures by collecting and describing data that is intended to help in the development of a theory. This method is also called "ethnomethodology" or "methodology of the people". An example of applied ethnographic research is the study of a particular culture and their understanding of the role of a particular disease in their cultural framework.

- Grounded Theory is an inductive type of research, based or "grounded" in the observations or data from which it was developed; it uses a variety of data sources, including quantitative data, review of records, interviews, observation and surveys.

- Phenomenology describes the "subjective reality" of an event, as perceived by the study population; it is the study of a phenomenon.

- Philosophical Research is conducted by field experts within the boundaries of a specific field of study or profession, the best qualified individual in any field of study to use an intellectual analysis, in order to clarify definitions, identify ethics, or make a value judgment concerning an issue in their field of study their lives.

- Critical Social Research, used by a researcher to understand how people communicate and develop symbolic meanings.

- Ethical Inquiry, an intellectual analysis of ethical problems. It includes the study of ethics as related to obligation, rights, duty, right and wrong, choice etc.

- Foundational Research, examines the foundations for a science, analyses the beliefs, and develops ways to specify how a knowledge base should change in light of new information.

- Historical Research allows one to discuss past and present events in the context of the present condition, and allows one to reflect and provide possible answers to current issues and problems. Historical research helps us in answering questions such as: Where have we come from, where are we, who are we now and where are we going?

ADDITIONAL READINGS

Below are some recommended educational materials to support your understanding of qualitative research.

Mack, N., Woodsong, C., MacQueen, K.M., Guest, G. & Namey, E. (2011). Qualitative Research Methods: A Data Collector's Field Guide. USAID, Washington, DC. Available at: http://www.fhi360.org/sites/default/files/media/documents/Qualitative%20Research%20Methods%20-%20A%20Data%20Collector%27s%20Field%20Guide.pdf

ACTION RESEARCH

Action research is a unique research process that has been used in a wide variety of education, social welfare and educational settings. Some would argue that Action Research is not really a research method, but more of an investigative and decision making tool. Basically it involves undertaking research into one's own practice with the aim of improving it. In principle it could be carried out by any individual or group, but here we are going to concentrate on professional staff working in education.

Action research is unlike other forms of research in two ways. Firstly, the researchers are directly concerned with the social situation they are investigating, instead of standing outside it and looking in. However, to help them think more clearly and avoid bias, they often use an outsider as consultant or 'critical friend'. Secondly, while most research tries not to affect the situation being researched, action research aims to intervene and to change part of the process. These changes are then monitored and analysed to form part of the findings.

Altrichter outlined the action research process like this:

> *Action research tends to start from some practical problem or concern, and aims to develop and improve both the practical situation, and the knowledge of the participants. It usually proceeds in a series of stages:*

a. *Finding a starting point.*

b. *Clarifying the situation.*

c. *Developing action strategies and putting them into practice (return to B).*

d. *Making the resulting knowledge public.*

> *Action research begins with finding a starting point for development within one's practice (Stage A). Then, through conversations, interviews and other methods of collecting evidence, and through analysis of the information* gained, the situation is clarified (Stage B). As a consequence of this clarification, action strategies are developed and put into practice (*Stage C).*
>
> *Normally, the new action strategies will not solve a problem immediately. Therefore, their effects and side-effects need to be monitored in order to learn from experience and further improve the action strategies. So the research process moves back into clarification of the new situation and the development of further action strategies (returning to Stage B). Two, three or even four cycles of planning, acting and reflecting on what has happened may be undertaken. At the end of the project the researchers make their new knowledge and understanding accessible to others by producing written case studies, or by oral presentations to other professionals in their*

field (Stage D). In this way their insights are opened up for critical discussion.

Adapted from Altrichter, 1993, pp 6-7

ADDITIONAL READINGS

Below is a recommended textbook that will help you learn more about Action Research.

The Alberta Teachers Association. (2000). Action Research Guide for Alberta Teachers. Available at: http://www.teachers.ab.ca/SiteCollectionDocuments/ATA/Publications/Professional-Development/ActionResearch.pdf

WHICH METHODS SHOULD I USE?

This is a reasonable question for somebody about to ask on their first research project, but it is a difficult one to answer. I will outline some possible answers.

Use appropriate methods

One answer is to say that you should pick the methods that are appropriate to the research problem. For example, if you want to know the dropout rate on a given course, you will clearly go for a 'quantitative' study, probably based on course registration or attendance data. If you want to find out about the effect on village women of a radio campaign about contraception, you might well decide that this should be done qualitatively by sensitive women interviewers in people's own homes.

Use methods rigorously

Most researchers would agree with this, but there are divisions within social science as to how social reality can be understood and hence what can be called 'scientific'. Adherents of the quantitative, empirical school always select 'objective' surveys, tests and experiments, while those who feel that such methods do not tap into 'what is really going on' favour fieldwork based on observation, participation and interviews.

What I mean is that whichever philosophical or methodological approach you adopt, there are customs, rules of procedure and standards that must be observed.

Quantitative research may look more 'scientific' but if, for example, it breaks some statistical rules then it is not scientific. Some qualitative research may feel more like journalism or story-telling, but if it has been carried out using a rigorous and explicit set of criteria then it, too, is 'scientific'. In later modules we lay out some of the rules and procedures for both quantitative and qualitative data collection and analysis.

Use methods demanded by the situation

Occasionally time was a major constraint that would affect the amount and type of research that can be conducted.

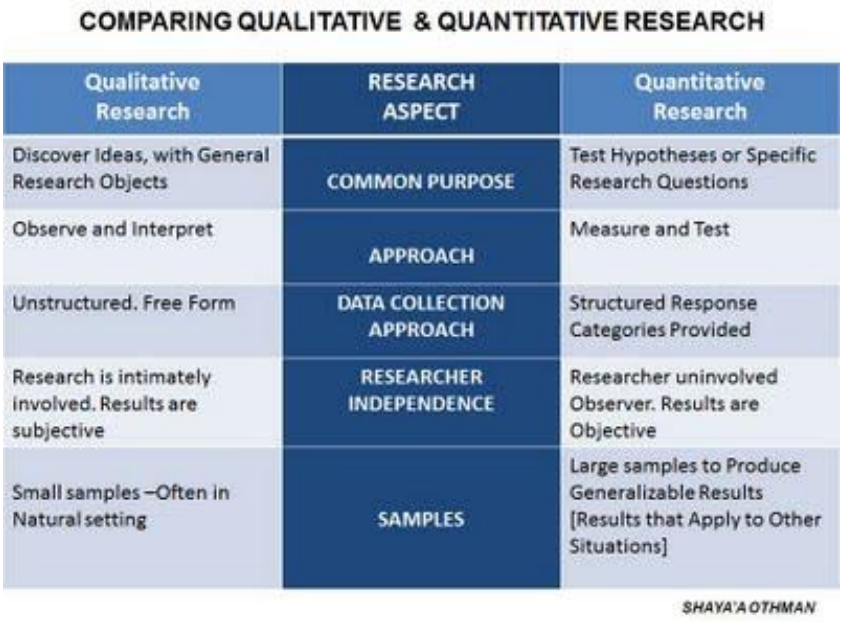
Use multiple methods wherever possible

In recent years, more and more researchers seem to have come to the conclusion that it is better to select a variety of research methods when approaching a problem, rather than any one single method. This is particularly the case when attempting to evaluate a whole course or programme.

It is now generally acknowledged that it is insufficient to evaluate a programme on the basis of pre-and post-tests of the knowledge held by learners. This is especially so in the case of traditional and distance education where environmental factors, at home and at work, are likely to play a greater part. While we still need to know what has been learned, we also need to find out the reactions of all the people concerned, to know how the programme was actually run, and about any positive or negative side-effects.

Multiple methods are needed because different facets of the problem are best addressed in different ways, and you are more likely to describe a complex social phenomenon accurately if you set about measuring it from several different points rather than just one.

BENEFITS OF COMBINING QUALITATIVE & QUANTITATIVE METHODS



While the quantitative design strives to control for bias so that facts can be understood in an objective way, the Qualitative approach is striving to understand the perspective of the program stakeholders, looking to first-hand experience to provide meaningful data.

The accumulation of facts and causes of behaviour are addressed by quantitative methodology as the qualitative methodology addresses concerns with the changing and dynamic nature of reality.

Quantitative research designs strive to identify and isolate specific variables within the context (seeking correlation, relationships, causality) of the study as the Qualitative design focuses on a holistic view of what is being studied (via documents, case histories, observations and interviews).

Quantitative data is collected under controlled conditions in order to rule out the possibility that variables other than the one under study can account for the relationships identified while the Qualitative data are collected within the context of their natural occurrence.

Both Quantitative and Qualitative research designs seek reliable and valid results. Data that are consistent or stable as indicated by the researcher's ability to replicate the findings is of major concern in the Quantitative arena while validity of the Qualitative findings are paramount so that data are representative of a true and full picture of constructs under investigation.

By combining methods, advantages of each methodology complements the other making a stronger research design which results in more valid and reliable findings. The inadequacies

of individual methods are minimized and more threats to Internal Validity are realized and addressed.

SUMMARY

This lengthy topic introduced the different forms of research that an educational leader can choose. Whether you are conducting research or reviewing the research of others, you must be able to understand the methods they have used and you must be able to judge the reliability and validity of their findings and recommendation.

REFERENCES

Driscoll, M.P. (2004). Psychology of Learning for Instruction. Third Edition. Boston, Pearson Publishing.

ACTIVITY – REVIEWING RESEARCH ARTICLES

Before moving on to the next topic review the following three research articles. Each represents a different research method. Once you have read the articles then ask yourself the following questions and record your responses in your personal journal.

1. What method does the article demonstrate?
2. What was the research question the researchers were investigating?
3. What was the audience the researchers had targeted.
4. List the types of data did they collect.
5. How did they compare the data?

Anwaruddin, S.M. (2013). Web 2.0 and Language Learners' Motivation: An Action Research Study. The Canadian Journal of Action Research, Vol 14, No 1, pp. 69 – 71. Available at: http://cjar.nipissingu.ca/index.php/cjar/article/download/72/48

Afrassa, T.M. & Keeves, J.P. (1999). Changes in Students' Mathematics Acheivement in Australian Lower Secondary Schools Over Time. International Education Journal, Vol 1, No 1, pp. 1 – 21. Available at: http://ehlt.flinders.edu.au/education/iej/articles/v1n1/afrassa/afrassa.pdf

Abraham, G.Y. (n.d.). Life Orientation: Lessons on Leadership Qualities and Voting in Grade Three Classes in South Africa. The Online Educational Research Journal. Available at: http://www.oerj.org/View?action=viewPDF&paper=78

TOPIC 2.2 – QUALITATIVE RESEARCH METHODS

INTRODUCTION

In the last topic we explored a variety of research methods. Teachers and educational leaders often have very specific questions that need an answer. The use of research methods will help educators and others answer their questions.

In this section we will explore the use of qualitative methods in more detail. Educational researchers examine the world, see a problem or interesting pattern, and set out to study it. They use research methods to design a study—perhaps a detailed, systematic, scientific method for conducting research and obtaining data, or perhaps an ethnographic study utilizing an interpretive framework. Selecting the method and planning the research design is a key step in any education study.

OBJECTIVES

Upon completion of this topic you will be able to select an appropriate qualitative research method to explore specific educational questions.

ACKNOWLEDGEMENT

Large portions of this topic have been extracted from the CCBY licenced product:

OpenStax College. (2012, June 12). Research Methods. Retrieved from the Connexions Web site: http://cnx.org/content/m42960/1.3/

OVERVIEW

When entering a particular environment, a researcher must be careful. There are times to remain anonymous and times to be overt. There are times to conduct interviews and times to simply observe. Some participants need to be thoroughly informed of the research effort; others should not know they are being observed. A researcher wouldn't stroll into a crime-ridden neighbourhood at midnight, calling out, "Any gang members around?" And if a researcher walked into a classroom and told the teacher and students that they would be observed as part of a study on classroom management, the self-conscious, intimidated participants might not behave naturally.

EXAMPLE – VISIBILITY OF THE RESEARCHER

In the 1920s, leaders of a Chicago factory called Hawthorne Works commissioned a study to determine whether or not lighting could increase or decrease worker productivity. Researchers were brought in. Changes were made. Productivity increased. Results were published.

But when the study was over, productivity dropped again. Why did this happen? In 1953, Henry A. Landsberger analysed the study results to answer this question. He realized that employee productivity increased because the researchers were paying attention to the

employees. The researchers' physical presence influenced the study results. Worker behaviours were altered not by the lighting but by the study itself. They knew they were being observed and thus worked harder. From this, researchers learned the importance of carefully planning their roles as part of their research design and defining the role of the researcher (Franke and Kaul 1978).

Landsberger called the workers' response the **Hawthorne Effect— i.e.** people changing their behaviour because they know they are being watched as part of a study. The Hawthorne Effect is unavoidable in some research. In many cases, educators have to make the purpose of the study known. Subjects must be aware that they are being observed, and a certain amount of artificiality may result (Sonnenfeld 1985).

VISIBLE OR NOT

Making researchers' presence invisible is not always realistic. For example this option is not available to a researcher studying prison behaviours, early education, or the Ku Klux Klan. Researchers can't just stroll into prisons, kindergarten classrooms, or Klan meetings and unobtrusively observe behaviours. In situations like these, other methods are needed. All studies shape the research design, while research design simultaneously shapes the study. Researchers choose methods that best suit their study topic and that fit with their overall approach to research.

In planning a study's design, education researchers often choose from four widely used methods of scientific investigation: survey, field research, experiment, and secondary data analysis (or use of existing sources). Every research method comes with plusses and minuses, and the topic of study strongly influences which method or methods are put to use.

SURVEYS

As a research method, a survey collects data from subjects who respond to a series of questions about behaviours and opinions, often in the form of a questionnaire. The survey is one of the most widely used scientific research methods. The standard survey format allows individuals a level of anonymity in which they can express personal ideas. Questionnaires are a common research method.

At some point or another, everyone responds to some type of survey. A country's national census is an excellent example of a large-scale survey intended to gather sociological data. At the end of a course students fill out a survey, responding to questions that gauge their attitude toward the course, the content, the assessment methods and the instructor/teacher.

Not all surveys would be considered research. Marketing polls help companies refine marketing goals and strategies; they are generally not conducted as part of a scientific study, meaning they are not designed to test a hypothesis or to contribute knowledge to

the field of study. The results are not published in a refereed scholarly journal, where design, methodology, results, and analyses are vetted.

Often, polls on TV do not reflect a general population, but are merely answers from a specific show's audience. Polls conducted by programs such as American Idol or So You Think You Can Dance represents the opinions of fans but are not particularly scientific. A good contrast to these are the Nielsen Ratings, which determine the popularity of television programming through scientific marketing research methods.

Researchers conduct surveys under controlled conditions for specific purposes. Surveys gather different types of data from people. While surveys are not great at capturing the ways people really behave in social situations, they are a great method for discovering how people feel and think—or at least how they say they feel and think. Surveys can track preferences for presidential candidates or reported individual behaviours (such as study or texting habits), or factual information such as employment status, income, and education levels.

A survey targets a specific population, people who are the focus of the study, such as K to 12 students, college athletes, international students, or teenagers living with type 1 (juvenile-onset) diabetes. Most researchers choose to survey a small sector of the population, also known as a sample: that is, a manageable number of subjects who represent a larger population. The success of a study depends on how well a population is represented by the sample. In a random sample, every person in a population has the same chance of being chosen for the study. According to the laws of probability, random samples represent the population as a whole. For instance, a Gallup Poll, if conducted as a nationwide random sampling, should be able to provide an accurate estimate of public opinion whether it contacts 2,000 or 10,000 people. After selecting subjects, the researcher develops a specific plan to ask questions and record responses.

It is important to inform subjects of the nature and purpose of the study up front. If they agree to participate, researchers thank subjects and offer them a chance to see the results of the study if they are interested. The researcher presents the subjects with an instrument, a means of gathering the information.

A common instrument is a questionnaire, in which subjects answer a series of questions. For some topics, the researcher might ask yes-or-no or multiple-choice questions, allowing subjects to choose possible responses to each question. This kind of quantitative data—research collected in numerical form that can be counted—are easy to tabulate. Just count up the number of "yes" and "no" responses or correct answers and chart them into percentages. Questionnaires can also ask more complex questions with more complex answers—beyond "yes," "no," or the option next to a checkbox. In those cases, the answers are subjective, varying from person to person. How do plan to use your college education? Why do you follow Jimmy Buffett around the country and attend every concert? Those

types of questions require short essay responses, and participants willing to take the time to write those answers will convey personal information about religious beliefs, political views, and morals. Some topics that reflect internal thought are impossible to observe directly and are difficult to discuss honestly in a public forum. People are more likely to share honest answers if they can respond to questions anonymously. This type of information is qualitative data—results that are subjective and often based on what is seen in a natural setting. Qualitative information is harder to organize and tabulate. The researcher will end up with a wide range of responses, some of which may be surprising. The benefit of written opinions, though, is the wealth of material that they provide. An interview is a one-on-one conversation between the researcher and the subject, and is a way of conducting surveys on a topic. Interviews are similar to the short answer questions on surveys in that the researcher asks subjects a series of questions. However, participants are free to respond as they wish, without being limited by predetermined choices. In the back-and-forth conversation of an interview, a researcher can ask for clarification, spend more time on a subtopic, or ask additional questions. In an interview, a subject will ideally feel free to open up and answer questions that are often complex. There are no right or wrong answers. The subject might not even know how to answer the questions honestly. Questions such as “How did society's view of alcohol consumption influence your decision whether or not to take your first sip of alcohol?” or “Did you feel that the divorce of your parents would put a social stigma on your family?” involve so many factors that the answers are difficult to categorize. A researcher needs to avoid steering or prompting the subject to respond in a specific way; otherwise, the results will prove to be unreliable. And, obviously, a sociological interview is not an interrogation. The researcher will benefit from gaining a subject’s trust, from empathizing or commiserating with a subject, and from listening without judgment.

Activity - Example Survey Research Article

The link below will provide access to the International Education Journal. The article by Frumkin is an example of how to design a survey research study. Please read the Frumkin research study and identify the key steps she used in conducting the research. Record your response in your personal journal.

Fumkin, L. (2006) Does increasing communication through visual learning environments enhance student perceptions of lecturers? *International Education Journal*, 2006, 7(5), 688-698. ISSN 1443-1475. Available at: http://www.iejcomparative.org/data/volumes/v7n5.pdf

FIELD RESEARCH

The work of educators rarely happens in limited, confined spaces. Educational researchers study subjects where they live, work, study and play. Field research refers to gathering primary data from a natural environment without doing a lab experiment or a survey. It is a research method suited to an interpretive framework rather than to the scientific method. To conduct field research, the researcher must be willing to step into new environments and observe, participate, or experience those worlds. In field work, the researcher, rather than the subjects, are the ones out of their element.

The researcher interacts with or observes a person or people, gathering data along the way. The key point in field research is that it takes place in the subject's natural environment, whether it's a classroom, home environment, coffee shop or tribal village.

In conducting studies about pockets of culture, most researchers seek to discover a universal appeal. Here, we will look at three types of field research: participant observation, ethnography, and the case study.

Participant Observation

In 2000, a comic writer named Rodney Rothman wanted an insider's view of white-collar work. He slipped into the sterile, high-rise offices of a New York "dot com" agency. Every day for two weeks, he pretended to work there. His main purpose was simply to see if anyone would notice him or challenge his presence. No one did. The receptionist greeted him. The employees smiled and said good morning. Rothman was accepted as part of the team. He even went so far as to claim a desk, inform the receptionist of his whereabouts, and attend a meeting. He published an article about his experience in The New Yorker called "My Fake Job" (2000). Later, he was discredited for allegedly fabricating some details of the story and The New Yorker issued an apology. However, Rothman's entertaining article still offered fascinating descriptions of the inside workings of a "dot com" company and exemplified the lengths to which a person will go to uncover material.

Rothman had conducted a form of study called participant observation, in which researchers join people and participate in a group's routine activities for the purpose of observing them within that context. This method lets researchers experience a specific aspect of social life. A researcher might go to great lengths to get a first-hand look into a trend, institution, or behaviour.

Researchers temporarily put themselves into roles and record their observations. A researcher might work as a janitor in a school, or an administrative clerk in a school district. Often, these researchers try to blend in seamlessly with the population they study, and they may not disclose their true identity or purpose if they feel it would compromise the results of their research.

Participant observation is a useful method if the researcher wants to explore a certain environment from the inside. Field researchers simply want to observe and learn. In such a setting, the researcher will be alert and open minded to whatever happens, recording all observations accurately. Soon, as patterns emerge, questions will become more specific, observations will lead to hypotheses, and hypotheses will guide the researcher in shaping data into results.

In a study of small-town America conducted by sociological researchers John S. Lynd and Helen Merrell Lynd, the team altered their purpose as they gathered data. They initially planned to focus their study on the role of religion in American towns. As they gathered observations, they realized that the effect of industrialization and urbanization was the more relevant topic of this social group. The Lynds did not change their methods, but they revised their purpose. This shaped the structure of Middletown: A Study in Modern American Culture, their published results (Lynd and Lynd 1959).

The Lynds were upfront about their mission. The townspeople of Muncie, Indiana, knew why the researchers were in their midst. But some of the researchers prefer not to alert people to their presence. The main advantage of covert participant observation is that it allows the researcher access to authentic, natural behaviours of a group's members. The challenge, however, is gaining access to a setting without disrupting the pattern of others' behaviour.

Becoming an inside member of a group, organization, or subculture takes time and effort. Researchers must pretend to be something they are not. The process could involve role playing, making contacts, networking, or applying for a job. Once inside a group, some researchers spend months or even years pretending to be one of the people they are observing. However, as observers, they cannot get too involved. They must keep their purpose in mind and apply the sociological perspective. That way, they illuminate social patterns that are often unrecognized.

Because information gathered during participant observation is mostly qualitative, rather than quantitative, the end results are often descriptive or interpretive. The researcher might present findings in an article or book, describing what he or she witnessed and experienced.

This type of research is what journalist Barbara Ehrenreich conducted for her book Nickel and Dimed. One day over lunch with her editor, as the story goes, Ehrenreich mentioned an idea. How can people exist on minimum-wage work? How do low-income workers get by? she wondered. Someone should do a study. To her surprise, her editor responded, Why don't you do it? That's how Ehrenreich found herself joining the ranks of the working class.

For several months, she left her comfortable home and lived and worked among people who lacked, for the most part, higher education and marketable job skills. Undercover, she applied for and worked minimum wage jobs as a waitress, a cleaning woman, a nursing

home aide, and a retail chain employee. During her participant observation, she used only her income from those jobs to pay for food, clothing, transportation, and shelter. She discovered the obvious, that it's almost impossible to get by on minimum wage work. She also experienced and observed attitudes many middle and upper class people never think about. She witnessed first-hand the treatment of working class employees. She saw the extreme measures people take to make ends meet and to survive. She described fellow employees who held two or three jobs, worked seven days a week, lived in cars, could not pay to treat chronic health conditions, got randomly fired, submitted to drug tests, and moved in and out of homeless shelters. She brought aspects of that life to light, describing difficult working conditions and the poor treatment that low-wage workers suffer. Nickel and Dimed: On (Not) Getting By in America, the book she wrote upon her return to her real life as a well-paid writer, has been widely read and used in many college classrooms.

Activity – Field Research Approach

Review the following web site to learn more about field research. Ask yourself how can I apply these techniques in conducting educational research. Record your observations in your personal journal.

CSU. (n.d.). Conducting Field Research. Web Site. Available at: http://writing.colostate.edu/guides/guide.cfm?guideid=23

Ethnography

Ethnography is the extended observation of the social perspective and cultural values of an entire social setting. Ethnographies involve objective observation of an entire community. The heart of an ethnographic study focuses on how subjects view their own social standing and how they understand themselves in relation to a community. An ethnographic study might observe, for example, a small American fishing town, an Inuit community, a village in Thailand, a Buddhist monastery, a private boarding school, or Disney World. These places all have borders. People live, work, study, or vacation within those borders. People are there for a certain reason and therefore behave in certain ways and respect certain cultural norms. An ethnographer would commit to spending a determined amount of time studying every aspect of the chosen place, taking in as much as possible. A researcher studying members in a private school might watch the way students and faculty go about their daily lives and then write a paper about it. To observe a spiritual retreat centre, an ethnographer might sign up for a retreat and attend as a guest for an extended stay, observe and record data, and collate the material into results.

Ethnographers had been examining other cultures for decades—groups considered minority or outsider—like gangs, immigrants, and the poor. But no one had studied the so-called average citizen.

Activity – Ethnographic Research Methods

Review the article below and become familiar with the different approaches and tools used in ethnographic studies. Think of a potential research issue that you could examine using the approaches and tools described in the article. Produce a brief description of the study and its methodology and record your response in your personal journal.

> Genzuk, M. (2003). *A Synthesis of Ethnographic Research*. Occasional Papers Series. Center for Multilingual, Multicultural Research (Eds.). Center for Multilingual, Multicultural Research, Rossier School of Education, University of Southern California. Los Angeles. Available at: http://www-bcf.usc.edu/~genzuk/Ethnographic_Research.pdf

Case Study

Sometimes a researcher wants to study one specific person or event. A case study is an in-depth analysis of a single event, situation, or individual. To conduct a case study, a researcher examines existing sources like documents and archival records, conducts interviews, engages in direct observation, and even participant observation, if possible. Researchers might use this method to study a single case of, for example, an educational leader, a disabled child in school, the impact of the shooting at Sandy Hook Elementary School or the impact of cheating at a specific school.

However, a major criticism of the case study as a method is that a developed study of a single case, while offering depth on a topic, does not provide enough evidence to form a generalized conclusion. In other words, it is difficult to make universal claims based on just one person or incident, since one person or incident does not verify a pattern. However, case studies are useful when the single case is unique. In these instances, a single case study can add tremendous knowledge to a certain discipline.

For example, a feral child, also called “wild child,” is one who grows up isolated from human beings. Feral children grow up without social contact and language, elements crucial to a “civilized” child’s development. These children mimic the behaviours and movements of animals, and often invent their own language. There are only about one hundred cases of “feral children” in the world. As you may imagine, a feral child is a subject of great interest to researchers.

Feral children provide unique information about child development because they have grown up outside of the parameters of “normal” child development. And since there are very few feral children, the case study is the most appropriate method for researchers to use in studying the subject.

In traditional education small groups of individuals like gifted children with unique talents could be the subject of individual case studies.

Activity – Example Case Study

Review the case study below. Explain the process the researchers used to conduct the study. Consider their findings and discuss how generalizable they are. Record your responses in your personal journal.

> Prytula, M. & Weiman, K. (2012). Collaborative professional development: An examination of changes in teacher identity through the professional learning community. Journal of Case Studies in Education; Volume 3, July 2012. Available at: http://www.aabri.com/manuscripts/11964.pdf

SUMMARY

This topic provided details and examples of how to conduct qualitative research studies in education. The topic was not extensive and additional readings and personal literature reviews should be completed to gain a further understanding of different qualitative methods.

TOPIC 2.3 – QUANTITATIVE METHODS

INTRODUCTION

Quantitative research methods, as explained in the first unit, rely heavily on the use of statistical analysis to complete different forms of comparison. The aim is to create measures and collect data that then can be analysed to determine if the data is does or does not have any significant difference when comparing groups within in a specific population based on proposed hypothesis.

In this topic we will explore some of the more common methods of conducting a quantitative research study.

OBJECTIVE

Upon completion of this topic the learners will be able to:

1. Describe different quantitative methods.
2. Select an appropriate quantitative method appropriate to the research question.
3. Examine education related research articles.

ACKNOWLEDGEMENT

Large portions of this topic have been extracted from the CCBY licenced product:

OpenStax College. (2012, June 12). Research Methods. Retrieved from the Connexions Web site: http://cnx.org/content/m42960/1.3/

OVERVIEW

You've probably tested personal learning theories as a student. "If I study at night and review in the morning, I'll improve my retention skills." Or theories about behaviour, "If I stop drinking soda, I'll feel better." These theories are considered "Cause and Effect" theories. If this, then that. When you test the theory, your results either prove or disprove your hypothesis. One way researchers test theories is by conducting an experiment, meaning they investigate relationships to test a hypothesis—a scientific approach. There are two main types of experiments: lab-based experiments and natural or field based experiments.

In a lab setting, the research can be controlled so that perhaps more data can be recorded in a certain amount of time. In a natural or field-based experiment, the generation of data cannot be controlled but the information might be considered more accurate since it was collected without interference or intervention by the researcher. As a research method, either type of experiment is useful for testing if-then statements: if a particular thing happens, then another particular thing will result.

To conduct a lab-based experiment, sociologists create artificial situations that allow them to manipulate variables. Classically, the researcher selects a set of people with similar characteristics, such as age, class, race, or education. Those people are divided into two groups. One is the experimental group and the other is the control group.

The experimental group is exposed to the independent variable(s) and the control group is not. (Independent variables are those things that are manipulated by the researcher. For example, room temperature, lighting, size of type, colour, etc.) To test the benefits of tutoring, for example, the sociologist might expose the experimental group of students to a number of tutoring sessions but not the control group. Then both groups would be tested for differences in performance to see if tutoring had an effect on the experimental group of students. As you can imagine, in a case like this, the researcher would not want to jeopardize the accomplishments of either group of students, so the setting would be somewhat artificial. The test would not be for a grade reflected on their permanent record, for example.

Activity – Example Experiment in an Education Setting

The article listed below describes the results of an experiment on the use of school vouchers on college enrolments. Read the article and note the differences between a qualitative study (reviewed earlier in the last topic) and a quantitative study. List the similarities and differences in your personal journal and your reaction to this form of research.

> Chingos, M.M. & Peterson, P.E. (2012). The effects of school vouchers on college enrolment: Experimental evidence from New York City. The Brown Centre of Education Policy; Harvard University. Available at: http://www.brookings.edu/~/media/Research/Files/Papers/2012/8/23%20school%20vouchers%20harvard%20chingos/Impacts_of_School_Vouchers_FINAL.pdf

Secondary Data Analysis

While researchers often engage in original research studies, they also contribute knowledge to the discipline through secondary data analysis. Secondary data isn't the result of research collected from primary sources, but an analysis of the already completed work of other researchers. Educators might study works written by learning theorists, teachers, or other specialists in education. They might search through periodicals, newspapers, or magazines from any period in history. Using available information and data that is already published not only saves time and money, but it can add depth to a study.

Researchers often interpret findings in a new way, a way that was not part of an author's original purpose or intention. To study how women were encouraged to act and behave in the 1960s, for example, a researcher might watch movies, televisions shows, and situation comedies from that period. Or to research changes in behaviour and attitudes due to the emergence of television in the late 1950s and early 1960s, a researcher would rely on new

interpretations of secondary data. Decades from now, researchers will most likely conduct similar studies on the advent of mobile phones, the Internet, or Facebook. Social scientists also learn by analysing the research of a variety of agencies.

Governmental departments and global groups, like the U.S. Bureau of Labour Statistics or the World Health Organization, publish studies with findings that are useful to a wide range of researchers. A public statistic like the foreclosure rate might be useful for studying the effects of the 2008 recession; a racial demographic profile might be compared with data on education funding to examine the resources accessible by different groups.

One of the advantages of secondary data is that it is nonreactive (or unobtrusive) research, meaning that it does not include direct contact with subjects and will not alter or influence people's behaviours. Unlike studies requiring direct contact with people, using previously published data doesn't require entering a population and the investment and risks inherent in that research process.

Using available data does have its challenges. Public records are not always easy to access. A researcher will need to do some legwork to track them down and gain access to records. To guide the search through a vast library of materials and avoid wasting time reading unrelated sources, researchers employ content analysis, applying a systematic approach to record and value information gleaned from secondary data as they relate to the study at hand.

But, in some cases, there is no way to verify the accuracy of existing data. It is easy to count how many drunk drivers, for example, are pulled over by the police. But how many are not? While it's possible to discover the percentage of teenage students who drop out of high school, it might be more challenging to determine the number who return to school or get their GED later.

Another problem arises when data are unavailable in the exact form needed or do not include the precise angle the researcher seeks. For example, the average salaries paid to teachers at a public school is in most locations public record. But the separate figures don't necessarily reveal how long it took each teacher to reach the salary range, what their educational backgrounds are, or how long they've been teaching.

To write some of his books, researcher Richard Sennett used secondary data to shed light on current trends. In The Craftsman (2008), he studied the human desire to perform quality work, from carpentry to computer programming. He studied the line between craftsmanship and skilled manual labour. He also studied changes in attitudes toward craftsmanship that occurred not only during and after the Industrial Revolution, but also in ancient times. Obviously, he could not have first-hand knowledge of periods of ancient history; he had to rely on secondary data for part of his study.

When conducting content analysis, it is important to consider the date of publication of an existing source and to take into account attitudes and common cultural ideals that may have influenced the research. For example, Robert S. Lynd and Helen Merrell Lynd gathered research for their book Middletown: A Study in Modern American Culture in the 1920s. Attitudes and cultural norms were vastly different then than they are now. Beliefs about gender roles, race, education, and work have changed significantly since then. At the time, the study's purpose was to reveal the truth about small American communities. Today, it is an illustration of 1920s attitudes and values.

Activity – Identifying Secondary Sources

Think about a research question or topic that could use secondary data to explore your hypothesis. In your personal journal list the question or topic, your hypothesis and the data source and type of data you would explore.

SUMMARY

This topic explored the use of quantitative research methods and their use. As you now realize quantitative and experimental research relies heavily on statistics analysis. Later in the course we will briefly explore the use and interpretation of statistics in educational research.

UNIT SUMMARY

SUMMARY

Educational research is a fairly complex process. As you can see, a lot goes into even a simple research design. There are many steps and much to consider when collecting data on human behaviour, as well as in interpreting and analysing data in order to form conclusive results. We will explore the design of research studies in the next unit.

UNIT THREE – RESEARCH DESIGN

UNIT INTRODUCTION

The scientific method provides a system of organization that helps researchers plan and conduct the study while ensuring that data and results are reliable, valid, and objective. The many methods available to researchers—including experiments, surveys, field studies, and secondary data analysis—all come with advantages and disadvantages. The strength of a study can depend on the choice and implementation of the appropriate method of gathering research. Depending on the topic, a study might use a single method or a combination of methods. It is important to plan a research design before undertaking a study. The information gathered may in itself be surprising, and the study design should provide a solid framework in which to analyse predicted and unpredicted data.

UNIT OBJECTIVES

Upon completion of this unit you will be able to:

1. Develop a research question.
2. Plan a research study.
3. Produce a research proposal.

UNIT READINGS

As you complete this unit it is recommended that you read the following chapters/articles:

- Herts for Learning. (n.d.). Teacher Research Projects. Web Site. Available at: http://www.thegrid.org.uk/goodpractice/research_projects/
- Best, J.W. & Kahn, J.V. (1995). Chapter 2 – Selecting a Problem and Preparing a Research Proposal. In Educational Research. Seventh Edition. New Delhi, Prentice-Hall India. p. 31 – 60. Available at: http://www.nimhindia.org/The%20meaning%20of%20research.pdf

TOPIC 3.1 – DEVELOPING A RESEARCH QUESTION

INTRODUCTION

Earlier we explored some of the reasons why you would want to embark on a research project. As you start your own project, you must define your goals and describe the desired outcomes of your research. Before you start your research you must identify the key questions you wish to explore when conducting your study.

In this topic we look at the kind of questions or issues that arise in relation to your chosen area of interest. If you are planning a research project as an individual, you might do this on your own. If your colleagues have been involved in choosing a research area, you could brainstorm possible research questions as a group. Whichever way you decide to work, you now need to generate as many questions as possible.

OBJECTIVES

Upon completion of this topic you will be able to:

1. Develop appropriate research questions.
2. Narrow down your focus to a single guiding research question.
3. Analyse and compare different kinds of research questions, in relation to the kind of research approach that they suggest.

RESEARCH CONSIDERATIONS

Selection and creation of a research question will be influenced by the following decisions:

- Who is going to be involved in the choice of a research area?
- Why do I want to choose this particular research area?
- Does it fit into my institutional/organisational priorities and/or my own work?
- Who is going to support this project financially?
- How is the research going to be used later?

Activity – Question Planning Map

Before you attempt to create a research question complete this activity. It should help you to explore a variety of questions around your topic and help you to work out how they fit together. Record your responses in your personal journal.

In many situations, you may find yourself initially planning your research alone – particularly if you have no face-to-face contact with colleagues or students. Even if you are planning your research together with your colleagues, you will find this activity useful for mapping out your individual perspective on issues that have arisen within the group.

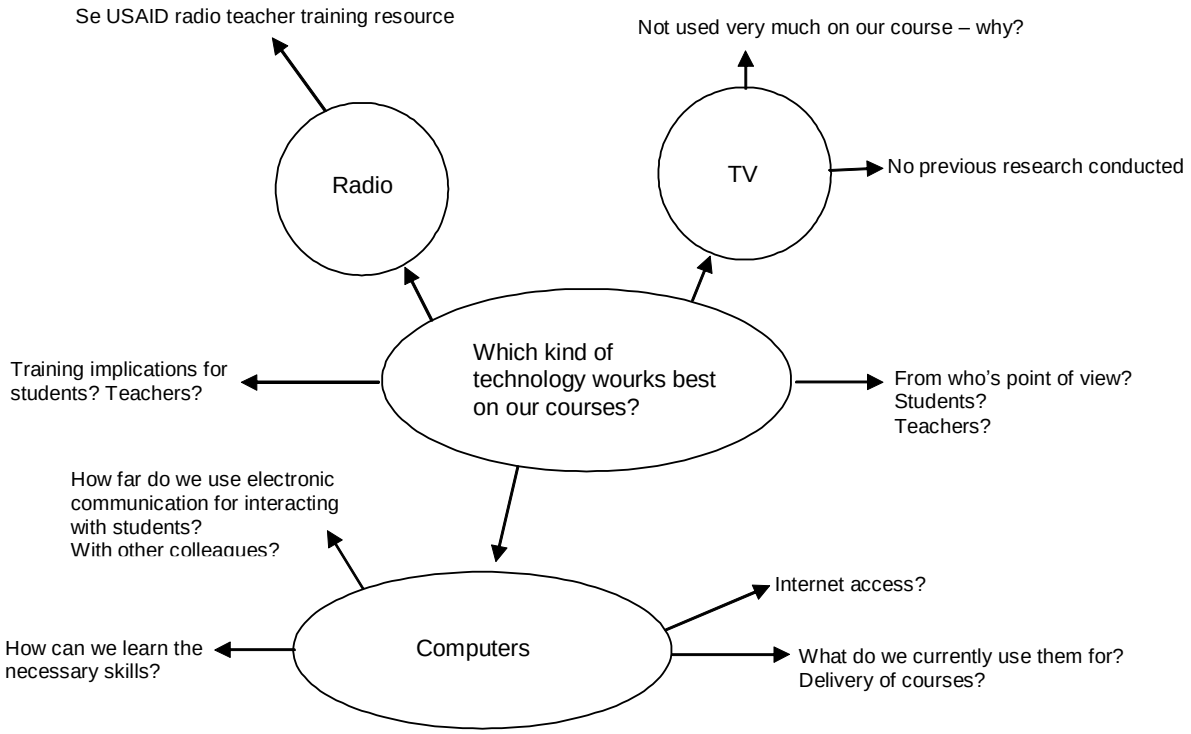
1. Write down one word that describes your overall research area (e.g. 'technology'). Put this in a circle in the middle of your page.

2. Now reflect on your experience in this area and use arrows to indicate the various issues that emerge (e.g. comparing technology – radios are too expensive, no access to Internet). These might also include issues raised by your colleagues (see above).

3. Try to find out about any previous research done in this area (both locally and internationally, as reported in journals, websites etc.). If you have access to the Internet, there are several websites containing summaries of completed educational research projects – see text box on Useful sources.

   At this stage, you do not need to read the research in depth, just get an idea of the topics and questions that have already been researched.

   What questions have already been asked in your area? Map them on a planning diagram. See the example below:



4. Use your diagram to find out:

    - Are there any gaps in this research area?
    - Is there any previous research that you can build on?
    - Which questions seem more/less important to you?
    - Which questions seem more/less important to your employer? Your organisation? Your government? Your students? Potential funding agencies?

Record your responses and planning diagram in your personal journal.

HOW MANY QUESTIONS?

You should now have collected many questions around your chosen area of research. The challenge is how to narrow these down. You want to identify a question that will guide your research journey, which is not so narrow that you immediately come to a dead end, yet not so wide and complex that you will never finish! Many researchers find this the most difficult task, since, the more you research, the more questions that arise!

Activity – Evaluating Research Questions

The purpose of this activity is to introduce you to ways to help you decide which question might be more appropriate for you to explore. In this activity, you will begin to anticipate the constraints that you may encounter through looking at one question rather than another, in order to find a research question or problem that you can realistically tackle.

Example Research Questions

1. What problems do women teachers encounter when enrolling and participating in radio teacher training courses? (In a specific teacher training institution in India.)
2. How do different media, such as print, radio and cassettes, compare in terms of costs per student and cost effectiveness? (A national government Open University programme.)
3. What combination of different delivery methods is most effective in a range of African country contexts? (Ghana, Tanzania, Kenya, Uganda and Zambia.)

Read the three research questions above and then answer the following questions for each.

1. List the practical constraints you might encounter when planning or carrying out the research. These might be about time, costs, personnel needed and location.
2. List any other points you would consider if deciding between the three questions.
3. Which research question would you choose to pursue and why? Which do you think would be most difficult?

Record your responses to the three questions in your personal journal.

FINDING A SOLID RESEARCH QUESTION/PROBLEM

You may spend a lot of time exploring and refining your research question, but you should not feel this is time wasted. This is an important first step as a researcher – to begin to understand your perspective on a problem, your assumptions and perhaps how you might see the problem as an outsider. These extracts from Kumar (1999) stress the importance of getting your research question or problem right:

> *'A research problem is like the foundation of a building. The type and design of the building is dependent upon the foundation. If the foundation is well-designed and strong, you can expect the building to be also. The research problem serves as the foundation of a research study: if it is well formulated, you can expect a good study to follow.'*
>
> *'You must have a clear idea with regard to what it is that you want to find out about and not what you think you must find.'*

'The formulation of a problem is like the 'input' into a study, and the 'output' – the quality of the contents of the research report… is entirely dependent upon it.'

(Kumar, 1999, p. 36)

EXAMPLE RESEARCH QUESTIONS

Below are three examples of educational research questions. The questions were downloaded from Can Tho University in Vietnam. Available at: http://www.ctu.edu.vn/guidelines/scientific/thesis/part1/Examples/1.3V%20Ed.htm

Example One

This research is aimed at testing the impact of implementing authentic materials in teaching English tenses. The study attempts to answer the research questions:

1. Are the learners' competence and performance of progressive tenses improved when authentic materials are used to teach English progressive tenses?
2. Do male and female learners improve their competence and performance of English progressive tenses equally?
3. What are the learners' perceptions of the grammar course in which authentic materials are used to teach English progressive tenses?

Hypothesis

The researcher hypothesized that the use of authentic materials would enhance the learners' competence and performance of English progressive tenses. It was also expected that there would be positive feedback about the content and usefulness of authentic materials from learners.

Example Two

A study by Can Tho University to identify the English as a Foreign Language (EFL) Learners' problems in the preparatory stage of doing their research.

Research Questions

1. What are the problems that EFL learners at Can Tho University often experience in the preparatory stage of doing research?
2. To what extent do they face the problems?
3. What are the causes of the problems?
4. Do the problems perceived originate from:

- the researchers' inability of taking advantage of research skills?
- the lack of research resources (i.e. facilities, materials, supervising staff, etc.)?

5. Do B.A researchers and M.A researchers face the same or different problems?

Example Three

A study of effectiveness of metacognitive and cognitive strategy use to writing performance in EFL classrooms.

This research was conducted to answer the two following questions:

1. Is there a correlation between metacognitive and cognitive strategy use and writing performance?

- Does the use of more strategies, result in higher written text scores are?
- Is there a correlation between metacognitive strategies and the 'task' completion, between cognitive strategies and the 'language' achievement?

2. Which metacognitive and cognitive strategies used by learners lead to more successful writing performance?

The writer hypothesized that, first, there would be a strong interaction between metacognitive and cognitive strategies and writing performance. In other words, the more strategies writers would use, the higher their scores of written texts would be. Also, there would be a correlation between metacognitive strategies and the 'task' completion, between cognitive strategies and the 'language' achievement. Second, metacognitive strategies would

play more important roles than cognitive ones in the success of the written texts. The writer would like to conduct this research project to test these hypotheses.

Example Four

Improving Can Tho University English Majors' Reading Performance with Self-Access Language Learning.

Aims and Questions

The aim of the research was to study the impact of self-access learning on students' performance and to explore their attitudes towards SALL. Hence, my study is guided by the following research questions:

1. Does a second-year student's reading performance from 2 interventions (directed and self-directed) differ from each other?
2. To what extent does the student's attitude towards the self-access program enhance his or her performance? Do these attitudes promote the integration of SALL pedagogy in Can Tho University?

Hypothesis

I set myself the essential task of guiding students of English to self-access learning by designing and implementing an experimental syllabus with the purpose of investigating differences in reading performance of students in two conditions. It is my hypothesis that when these students were helped to become independent learners with SALL, their reading performance would be improved at the end of the semester. This study helps gain insights into the students' attitudes towards the self-access learning program. If their attitudes are positive and their performance is improved, they will help integrate a self-access program into the fundamental language courses.

CHARACTERISTICS OF GOOD RESEARCH QUESTIONS

The following qualities (in no particular order) should be used to guide the creation of effective research questions:

1. It is grounded in a theoretical framework.
2. It is builds on, but also offers something new to, previous research.
3. It has the potential to suggest directions for future research.
4. It is a purpose or question that the researcher is sincerely interested and/or invested in.
5. It addresses directly or indirectly some problem in the world.

6. It takes ethical issues into consideration.
7. It clearly states the variables or constructs to be examined.
8. It is not biased in terminology or position.
9. It is simple.
10. It is manageable.

To learn more about how to create effective research questions you should review the following online article:

Chapter 3: Planning a research project and formulating research questions. Website. Available at: http://bookshop.blackwell.co.uk/extracts/9780199202959_bryman_SRM.pdf

SUMMARY

In this topic you have learned to:

1. Develop research questions to guide your project. Many researchers consider their research questions to be key to the success of their project – if it is too wide or vaguely constructed, you may find you lose your way. If it is too narrow it may result in findings that are not very useful.
2. Evaluate whether you can explore a certain research interest within your available resources. If you do not have the resources required, yet still want to develop that kind of enquiry you may never answer the original questions.
3. Create an effective research question that ideally lays the foundation for further research. You are building a body of knowledge one question at a time.

ACTIVITY

Identify an area of research interest (based on your earlier planning map) and produce one or more research questions that meet the ten criteria for an effective research question. Ensure the questions are written as hypothesis.

Record your responses in your personal journal.

TOPIC 3.2 – PLANNING YOUR RESEARCH

INTRODUCTION

You are adopting a new role as a researcher and this topic introduces some of the issues that may arise in relation to you as a researcher and your chosen research approach. Whilst issues such as validity, relevance, reliability, bias, sample and causality will be discussed in more depth later, you need to start thinking about these concepts when you are planning and designing your research. The aim of this topic is to encourage you to develop a research approach from your research question and to look critically at the inherent advantages and drawbacks of your chosen research approach.

OBJECTIVES

Upon completion of this topic you will be able to:

1. Understand how the concept of 'bias' relates to your own proposed research project.
2. Compare different kinds of research approaches and analyse the pros and cons of each.
3. Develop concrete ideas for a research approach around your research questions.

QUALITY OF A RESEARCH PROJECT

As you begin your journey as a researcher you quickly realize that some research projects are better than others. When you read research studies you should look for the researcher's bias. Bias is to be avoided for the following reasons:

Bias

Bias occurs when you inadvertently steer the findings of your project in a particular direction as in these three examples:

- only listening to and reporting what the boys said in the lesson, and ignoring the girls' comments because you can't hear them so well;
- interviewing people whom you can meet in the office, but not bothering to interview staff who work from home or outside office hours; and
- presenting a picture that confirms your previously held ideas about why people drop out from courses.

One of the hardest things to do as a researcher is to recognise your own bias – whether this is around your attitudes (perhaps that you relate more easily to a certain group of people) or perhaps your position as an 'insider' within the situation you are researching. But this is the first step towards designing a project which will be considered to be 'good' research.

Attitudes towards researcher bias have changed greatly over the years and it is now generally accepted that you cannot or should not aspire to conduct completely neutral or value-free social research.

These changing ideas about bias have greatly affected how we carry out research. For example, in the School of Education where I work, we have a classroom with a one-way mirror on the wall, which was built this way so that researchers could observe children interacting without the children being aware of their presence. I imagine when this room was built, researchers believed that they should minimise the effect of their presence and create a setting where the children would behave as 'naturally' as possible.

Today, researchers in would dispute how 'natural' this setting was, pointing out that even to bring children to play in a university department was an unnatural act – like a clinical experiment. They would also feel uneasy about the ethical implications of a researcher observing someone who did not know or consent to being researched. We now feel that we can learn more by going to do research in a school, where we observe children interacting with each other and their teachers – and importantly, they observe and interact with us too as researchers. Rather than aiming to reduce our impact on the classroom or educational setting, we may actually intend to initiate change, for example, through action research.

All this is about our changing notions of bias and validity. We now accept that every researcher will have a bias and that it is impossible to eliminate all bias in a research project. The challenge is to recognise and reflect on your bias throughout the project and to set up situations where you are able to compare your own findings with other people's views (including your research participants). You may come across the term **reflexivity** being used to describe the way that a researcher reflects upon and writes about her/his own position in the research project and how this has affected his/her research methods and findings.

Sample Size

When you are deciding who to interview or where to go to conduct your research, one of your first decisions will be around sample size. Should I interview one teacher or five? Six students or 600 students? Should I base my observation in one school or three? The issue about how large or small a sample size should be is partly around bias: your role as a researcher will be quite different if you are only interviewing one teacher and can get to know that person in such depth. Some people may feel that you can minimise bias as you can present the situation more fully from your respondent's point of view. Others may feel that your study is more biased as you have only focused on one point of view and not had the opportunity to compare other teachers' views. In any case, the implications that you draw from your findings around one teacher would be quite different from those of a large scale survey: you would be wise not to generalise statistically and suggest that this one teacher is representative of all teachers. It is not simply a question of sample size, but the

criteria that you use for sampling your population and what you intend to find out about them that help determine the extent of possible bias. You may also find that practical considerations influence your sample size too (e.g. such as how many colleagues have time to meet up with you out of working hours).

Decisions about sample size are closely related to our intended research approach: an in-depth ethnographic study would normally (depending on resources) be limited to a smaller sample size than a large national survey. In the following activity, you will need to analyse the ways in which our methodological stance influences decisions about sample size.

To help you calculate an appropriate sample size review the following:

Penn State. (n.d.). How to Determine a Sample Size. Cooperative Extension Department. Available at: http://extension.psu.edu/Evaluation/pdf/TS60.pdf

PLANNING YOUR APPROACH

In later units, we will be looking in greater detail at the implications of adopting certain research approaches and the kind of research tools you may choose to use. However, at this stage of preparing a proposal, a researcher should begin to explore different ways of designing their research around the proposed research question(s) and decide which research approach is most appropriate.

Small is beautiful or bigger is best?

Earlier you developed several questions, which could be the basis for your research investigation. You may have ended up with a single guiding research question and perhaps a hierarchy of questions relating to each other. Now is the time to begin to think how you would put these questions into operation and plan your research strategy around them.

Activity – Which Way to Go Next?

This activity is intended to lead you on from your research questions to think more deeply about how you intend to go about your research and to compare two possible courses of action.

1. Go back to your research questions and write down your main or guiding question.
2. Think of two completely different ways of investigating this question – the most obvious contrast might be a large scale survey or an in-depth case study. But you might think of other contrasting approaches that are appropriate to your topic. Call these two alternative approaches Plan A and Plan B and write these headings on two separate sheets of paper. For each approach (A and B), note down:
    - Who is your research audience?
    - How many people/groups do you aim to cover?

- Where will you be conducting the research?
- Over what time period?
- How will you be conducting the research?
- What tools might you use?
- How do you see your role?
- Will you be the sole researcher (or who else might be involved?)
- What kind of data do you expect to collect and analyse?
- How does this relate to your research question?
- How will this data be used later?
- What kind of bias can you predict within your research study?

3. Record your response in your course journal.

To learn more about planning your research project it is recommended you review the following article:

Rickinson, M. (n.d.). Tool-kit 1: Planning your research project. Web Site. Available at: http://www.thegrid.org.uk/goodpractice/research_projects/documents/toolkit_planning_projects.pdf

WHAT ARE YOUR OPTIONS

Who?

Say your question is around 'Why do women dropout of open university courses more frequently than men?', you might decide to do a survey of all male and female students in an open university, using a pre-coded questionnaire with reasons why they decided to enrol and the factors affecting their decision to stay on or leave the course. Alternatively, you might decide to do a case study of three women students, as compared to three male students – interviewing them in depth about their impressions of the course and observing the way they integrate their studies with everyday life.

How?

Both of these approaches would answer the question in a different way. With the first alternative (survey), you could collect statistical evidence as to the most likely reason why most women drop out and compare male and female student attitudes to studying. With the in-depth study, you would not be able to generalise about how the majority of dropouts feel about the institution/ course, but you could gain insights into the different ways that

women and men experience their courses, including their learning styles and how their home life interacts, and gain a more holistic picture of why women dropout.

Why?

Other differences in approach might be around who carries out the research and why. Within participatory and action research approaches, you as researcher may be researching your own practice with a view to improving it, or in the above example, you could involve students in researching their own experiences as learners and with their peers. The outcomes of this latter approach might be very different from the survey that aims to analyse student dropout rates and would be useful to differing groups of people (e.g. students or teachers, rather than those working at policy level). However, participatory approaches are often more time-intensive than conventional research approaches, because of the time required to build up collaborative relationships.

PRACTICAL CONSTRAINTS

When you are deciding on the path that you intend to take, you need to take into account all these factors, particularly:

- What resources do you have at your disposal? There is no point deciding to do a large-scale district survey with a ten person team, if you have no budget or free time.

- Which approach do you feel most comfortable with – both ideologically and in terms of your existing skills? If you decide to do complex statistical analysis, you will need access to the resources to develop these skills if you do not already have them. Qualitative approaches may seem appropriate but often require more thought about how the data will be used – particularly if your colleagues or policy makers are more familiar with quantitative approaches and value tables of statistics above in-depth ethnographic analysis!

- What is the overall purpose of your research and how do you intend the findings to be used? You need to take into account how your research is intended to be used. For example, if you conduct an in-depth analysis of a specific course, are you in a position to implement or suggest any changes?

- What kind of role will you adopt within the research and how does this affect bias within your study? For example, you may decide to do a large scale study rather than a case study of your own institution because of concerns about your bias as an insider and the need to triangulate your perceptions. Your contrasting plans may have differing ethical implications too (e.g. that you can protect the identity of informants in a large scale survey but less so in a case study of one institution). We will be looking at this later in the course.

SUMMARY

In this topic, you have begun to develop your research idea into a proposed study through comparing the different research approaches. Within the research proposals you have analysed and the two contrasting plans for your own research, you have identified issues around:

- bias (within your methods and your own role) ;
- sample group size and composition;
- research approach; and
- practical constraints.

All of these issues will be explored in detail in later modules but at the moment, you need to be aware in general terms of how these concerns can shape your proposal and influence your research design.

TOPIC 3.3 – THE RESEARCH PROPOSAL

INTRODUCTION

The purpose of this topic is to introduce you to the process of writing a research proposal. You will begin by looking at the purpose of writing a research proposal and analysing the key elements of a research proposal. Through analysis of actual proposals, you will gain an understanding of different approaches to proposal writing.

OBJECTIVES

Upon completion of this topic you will be able to:

1. Analyse the structure of a research proposal and identify the elements that could be included in your own. (e.g. problem formulation and overall aims, literature review, justification of research approach, methods of data collection and analysis, reporting, time scale/schedule of activities, cost estimation, dissemination strategies)

2. Identify and review the relevant literature in an appropriate form for your proposal, including becoming familiar with academic referencing conventions.

3. Evaluate what makes a strong or weak research proposal.

WHY WRITE A RESEARCH PROPOSAL?

Graduate Student Discussion

'It always helps to have one in case you don't know where you are going. Then later you will be more specific…' (Frank)

'It has to do with your personality – if you like to have guidelines for everyday life, planning your activities ahead of time.' (Rose)

'It acts as a guideline that helps others to understand what you are going to do or plan to do.' (Monique)

'In my country, you have to stick to the proposal once you have written one. In case you change, you have to answer your committee members queries. Once you commit yourself on paper about a research proposal, you have to do it.' (Rahina)

You don't have to write a research proposal before you start your research. However, many people find that it helps them plan their research in more detail and anticipate how things might work out in practice. Others do not have a choice – they have to write a detailed proposal if they are to seek funding or support from their employers. Or they may have to write a research proposal in order to get approval for the research from their institutional

managers or committees. As you can see from the comments from the researchers quoted above, there are many arguments for and against writing a proposal.

BENEFITS AND DRAWBACKS OF A PROPOSAL

Some of the benefits of writing a proposal are that it:

1. can help you to work out your ideas for research in detail and systematically, through developing clear research objectives, methods and questions;
2. can enable you to communicate your ideas about your proposed project clearly to your colleagues and research participants;
3. can get you into the habit of writing (as opposed to simply talking) about your research at an early stage, with the chance to learn more about how to communicate your ideas to a specific audience and experiment with different forms and structures;
4. can give you a structure to begin reviewing the relevant literature systematically and in a form which can also be used in your final report ;
5. is useful as an indication of where you started from and you can look back at how your research evolved – your research journal helps in the same way; and
6. is essential if you are to seek funding for your research project.

As Rahina pointed out in the earlier discussion, there can also be drawbacks – depending on how your proposal is viewed by you, your employer and your colleagues. The drawbacks include:

1. once approved, you may be expected to stick to what you said you would do in the proposal – even if your ideas or circumstances change;
2. just writing a proposal may push you into a more rigid, less open-ended research design than you intended, in your attempt to predict what you will be doing and what you anticipate finding out about; and
3. writing a good research proposal takes time – which could be spent on actually starting the research instead.

As a novice researcher, you will probably find that writing a research proposal is a good way to begin to narrow down your focus and plan your research in more detail. This involves not just planning the research activities and strategies, but looking ahead to how you want your research to be used and disseminated. However, you may well need to explain to your colleagues or employer that good research involves a process of continuous reflection and that your proposal should be regarded as the first step, not the blueprint for your research

project. The exciting part of doing research is that you do not know exactly what you will find round the next corner!

RESEARCH PROPOSAL CONTENT

What does a research proposal contain?

> *'It's an argument'*
>
> *'A hierarchy of concepts'*
>
> *'A recipe'*
>
> (Punch, 2000 and Kumar, 1996)

Research proposals are as varied in form as research reports. However, as the definitions quoted above suggest, there are some common understandings around how a proposal should be structured and what should be included. You are putting forward an argument for doing your research in a certain way and usually the proposal moves from a general purpose to the specific methods you intend to use (the 'hierarchy of concepts'). Some people regard the proposal as a recipe, in that you are listing the elements needed in your research project – though with the understanding that the ingredients and methods may change over time. You need to start out by thinking about:

What do I want to find out and how?

Who is it for?

What do I expect to happen?

Activity – Key Elements of a Proposal

Analysing the key elements in a research proposal, you will need to use the resource Gunawardena (see Appendix 1 – Proposal Example) for this activity.

1. Read the resource Gunawardena, which was written by a researcher at the Open University of Sri Lanka.
2. List the main sections of this proposal and write the heading/theme of each section at the top of a separate blank piece of A4 paper.
3. Now cut each paper so that it represents the relative length of that section, as compared to other sections (e.g. if the introduction is shorter than the 'methodology', then you might have a quarter piece of paper for the introduction and a whole piece for methodology).
4. On each piece of paper, note what kind of information has been included in this section. If it has been presented as a table or bullet points, note this down too.

5. Place your sections in order on the floor or table and indicate in red where the writer has quoted any references. Does she/he use the literature in one section more than others? Is there a separate section for the literature review?

6. What other sections could be included? Is there anything you would have done differently?

7. Summarise the argument of the proposal in one sentence.

Record your response in your personal journal.

DECIDING ON A STRUCTURE

There are many different ways in which you could structure your proposal, and how you present your ideas depends very much on your topic and approach. You may also be expected to adopt a structure common by your organisation or the funding agency to whom you are applying (if this is the case).

Comparing Research Proposal Structures

The structure of a research proposal both reflects and is influenced by the approach that you decide to adopt as a researcher.

1. Look at the three examples given below of how a research proposal could be structured. Each of these examples comes from a textbook on research design.

2. Compare these three examples and note what is different and what is similar between them.

Now look at the research proposal from Sri Lanka which you analysed earlier.

3. Which example do you feel most closely describes its structure?

4. Which elements are the same/different from this example?

5. How does the order of sections compare?

6. Thinking of your own intended research project, work out which sections you anticipate will be most relevant for you to include and which sections you may decide to exclude.

Record the headings that you intend to use in your personal journal so you have an idea of the framework you will use.

Example A

Introduction

- statement of the problem
- research questions/hypotheses
- theoretical perspective
- definition of terms
- delimitation and limitations of the study
- significance of the study

Review of the literature

Methods

- research design
- sample, population and subjects
- instruments and materials
- variables in the study
- data analysis

(Creswell, 1994)

Example B

Title and title page

Abstract

Introduction

- area and topic
- background and context
- statement of purpose (or aims)

Research questions

- general
- specific

Conceptual framework, theory, hypotheses (if appropriate)

The literature

Methods

- design – strategy and framework
- sample
- data collection – instruments and procedures
- data analysis

Significance

Limitations and delimitations (if appropriate)

Consent, access and participants' protection

References

Appendices

(Punch, 2000, p. 67)

(Note: 'Delimitations' refers to defining the limits or the boundaries of the study, whereas 'limitations' means the limiting conditions or constraints that you anticipate.)

Example C

1. A statement of the objectives of the study
2. A list of the hypotheses, if you are testing any.
3. The study design you are proposing to use.
4. The setting for your study.
5. The research instruments you are planning to use.
6. Information on sample size and sampling design.
7. Information on data processing procedures.
8. An outline of the proposed chapters for the report.
9. The study's problems and limitations.
10. A proposed time-frame.

(Kumar, 1996, p. 170)

To learn more about constructing an effective research proposal you should review the following articles:

McGranaghan, M. (n.d.). Guidelines on Writing a Research Proposal. University of Hawaii. Web Article. Available at: http://www2.hawaii.edu/~matt/proposal.html

OUUK Research Proposal Template – Available at: http://www.open.ac.uk/research/ethics/docs/3.ResearchProtocolgeneric-amended.doc

SUMMARY

In this topic, we have explored several different ways in which you might decide to present your research proposal. The research proposal structures discussed here brought out the following points:

- proposals can differ in the degree of detail provided about anticipated findings, sample size, research methods, according to the research approach adopted
- research proposals can differ in structure – some researchers choosing to integrate the literature they have read in every section, or perhaps to have a much longer section on 'research ethics' if this is a major concern. The structure will be influenced by your research topic, your approach and your own personality.

TOPIC 3.4 – COMPLETING THE LITERATURE REVIEW

INTRODUCTION

A literature review is often considered to be an essential, but dull, part of the research process. If you see that your task is to wade through every published work on your topic to produce an extensive list of relevant references, you will probably end up with yet another 'furniture sale catalogue'. As the above quotation suggests, there is a real danger that in your attempt to be comprehensive and include everything you have read, you may end up with just a list of names and dates. But there may be no indication as to how these writers have influenced your work or how you see them in relation to each other. Writing a literature review which is readable and relevant to your research is an art in itself and a skill worth developing.

OBJECTIVES

Upon completion of this topic you should be able to complete a literature review.

WHY A LITERATURE REVIEW?

Haywood and Wragg (1982: 2) have described certain literature reviews as:

> *The furniture sale catalogue, in which everything merits a one-paragraph entry no matter how skilfully it has been conducted: Bloggs (1975) found this, Smith (1976) found that, Jones (1977) found the other, Bloggs, Smith and Jones (1978) found happiness in heaven.*

Learning to read critically and selectively is the first stage of constructing a literature review. You do not need to read every piece of literature on your chosen topic, but you need to gain a feel for the overall field and work out how your own research might fit in. You might also find it easier to intersperse the literature throughout your report or proposal, rather than to think of it as a separate section. This will enable you to make more direct links between key concepts and approaches in your own research, and how these have been developed in the literature.

WHERE DOES YOUR LITERATURE REVIEW FIT INTO YOUR PROPOSAL?

You can integrate your literature review into your proposal in many different ways. Rather than first presenting a picture of the whole field (as Woodley does), some researchers decide to reflect in more depth about particular theoretical works or previous research that has influenced their approach and ideas on their subject. Here is an example of this approach, from a research student looking at distance learning in Malaysia:

> *Certainly the very first book that my supervisor gave me entitled: Points of viewing children thinking: a digital ethnographer's journey by Segall (1997) helps to build my interest in qualitative research. I think Segall's approach is very humanistic. She is able to build on rapport with students, with teachers*

> *and build trust and openness with her student informants. What I like about her is the space that Segall provides to the students. To an extent, the students themselves become producers and directors. Segall's direct participation makes her part of the group. She has a binding relationship. In addition, the students are empowered by the space and room given to them that allow them to manoeuvre their thinking. Segall's work and other research have strongly pointed to me that getting or building rapport with the actors in my research is the crucial most priority that I have to do during my fieldwork …*
>
> *(Dzakiria, nd)*

You can see how this review is quite different from Woodley's in showing the way that a certain book has shaped the researcher's approach and views on his role. Their reviews are however similar in that they both point to a certain work or piece of research which they intend to build upon in their own investigation. Though written in different ways, both reviews are effective in relating the literature to the research enquiry, though it would be unusual to find a review like Dzakiria's in a funding proposal, as opposed to an academic PhD proposal.

How to Quote References

References are essential to any research study. The readers need to know where the original idea came from. Quoting or paraphrasing other researchers or authors works without appropriate citation is in effect a form of plagiarism. In many studies and academic papers the writers often fail to quote others works and thus they reduce their own credibility and reputation as a researcher.

There are many different conventions for presenting references but you do not need to learn them all! (http://essential.sci.uce.ac.uk/harvard/index.html). The main thing is to be consistent in which way you decide to present your quotations, references and bibliography. Even in your research proposal, you should try to adopt one particular form and stick to it. If you are careful to look up and quote page numbers, dates and full titles at this early stage, you will save yourself a lot of time later. Though it may be tempting to take short-cuts and put in half-remembered quotes or references in your proposal, you may find you have to do the job all over again when you try to integrate sections from your proposal in your final report.

You need to select a citation method that is acceptable to your professional body, scholarly journals and/or the institution you are working in. Some of the more popular conventions and style guides include:

- American Psychological Association (APA) Style Guide – (the citation approach most often used by educators) - http://www.apastyle.org/index.aspx

- Chicago Style Guide - http://www.chicagomanualofstyle.org/tools_citationguide.html
- MLA Style Guide - http://www.mlahandbook.org/fragment/public_index

When you are quoting extracts from the literature, these should be indented and should be accompanied by the author's surname, date and the page number where you found the quotation. The citation must be formatted based on the acceptable style guide. This will help any future reader of your report to retrace your steps and look at your 'evidence' for him/herself, e.g. 'Such open schooling is not a cheap option.' (Yates and Bradley, 2000: 207). The bibliography should list every work that you cite in the text. Where there are two or more works by the same author, list them as 2000a, 2000b etc. Entries in the bibliography should be typed in this order: author, initials, date, title, place of publication, publisher.

> Yates, C. and Bradley, J. (eds.) 2000 Basic education at a distance, London: Routledge Falmer.
>
> Robinson, B. 1999 'Open and distance learning in the Gobi desert: non-formal education for nomadic women' Distance Education 20, 2: 181-204

There are several bibliographic computer packages which can help you do this task. With both Endnote and ProCite, you can keep an electronic record of what you have read by entering information in various fields. You can then choose how you want to present the references or bibliography and the program will do the formatting for you. This is particularly useful for compiling the bibliography or if you need to change the way in which references are presented. Many researchers also find these programs a convenient way of keeping notes on literature they have read, as an alternative to having, for example, a card reference system.

When quoting Internet sources, you will need to put the complete website reference (starting with http://www.), noting the date/time when you downloaded or consulted the article. It is worth bearing in mind that not all Internet references are reliable – and unlike articles that you consult in academic journals or books, will not necessarily have been through any quality control mechanisms.

TIPS FOR CONDUCTING A LITERATURE REVIEW

The University of Toronto (n.d.) offers the following tips when conducting a literature review.

Ask yourself questions like these:

1. What is the **specific thesis, problem, or research question** that my literature review helps to define?

2. What **type** of literature review am I conducting? Am I looking at issues of theory? methodology? policy? quantitative research (e.g. on the effectiveness of a new procedure)? qualitative research (e.g., studies)?

3. What is the **scope** of my literature review? What types of publications am I using (e.g., journals, books, government documents, popular media)? What discipline am I working in (e.g., nursing psychology, sociology, medicine)?

4. How good was my **information seeking**? Has my search been wide enough to ensure I've found all the relevant material? Has it been narrow enough to exclude irrelevant material? Is the number of sources I've used appropriate for the length of my paper?

5. Have I **critically analysed** the literature I use? Do I follow through a set of concepts and questions, comparing items to each other in the ways they deal with them? Instead of just listing and summarizing items, do I assess them, discussing strengths and weaknesses?

6. Have I cited and discussed studies **contrary** to my perspective?

7. Will the reader find my literature review **relevant, appropriate, and useful**?

Ask yourself questions like these about each book or article you wish to include in your literature review:

1. Has the author formulated a problem/issue?

2. Is it clearly defined? Is its significance (scope, severity, relevance) clearly established?

3. Could the problem have been approached more effectively from another perspective?

4. What is the author's research orientation (e.g., interpretive, critical science, combination)?

5. What is the author's theoretical framework (e.g., psychological, developmental, feminist)?

6. What is the relationship between the theoretical and research perspectives?

7. Has the author evaluated the literature relevant to the problem/issue? Does the author include literature taking positions she or he does not agree with?

8. In a research study, how good are the basic components of the study design (e.g., population, intervention, outcome)? How accurate and valid are the

measurements? Is the analysis of the data accurate and relevant to the research question? Are the conclusions validly based upon the data and analysis?

9. In material written for a popular readership, does the author use appeals to emotion, one-sided examples, or rhetorically-charged language and tone? Is there an objective basis to the reasoning, or is the author merely "proving" what he or she already believes?

10. How does the author structure the argument? Can you "deconstruct" the flow of the argument to see whether or where it breaks down logically (e.g., in establishing cause-effect relationships)?

11. In what ways does this book or article contribute to our understanding of the problem under study, and in what ways is it useful for practice? What are the strengths and limitations?

12. How does this book or article relate to the specific thesis or question I am developing?

SUMMARY

In this topic, you have:

- learnt ways of identifying and reviewing literature relevant to your research topic.
- been introduced to ways of organising and referring to other research or theoretical books that are relevant to your study.
- You need to decide early on how you are going to keep notes on the literature and which conventions you will adopt for quotations and references.
- Provided some tips on how to conduct a literature.

Activity – Literature Review

Think of your research question and produce a literature review for your research proposal. Insert a copy of your literature review results in your personal journal.

UNIT SUMMARY

SUMMARY

Within this unit, you:

- analysed the structure of a research proposal;
- evaluated what makes a good or bad proposal;
- began to make decisions about an appropriate structure for your own;
- explored various sources for your research questions, including previous research, theoretical literature, and most importantly, observations from you and your colleagues;
- began to look critically at which questions you would like and are able to use as the framework for your research; and
- considered issues around what makes a good piece of research – such as bias and ethical concerns.

REFERENCES

Bell, J. 1999 *Doing your own research project,* Buckingham: The Open University Press (extract pp 93-95)

Cresswell, J. 1994 *Research design: qualitative and quantitative approaches*, London: Sage

Dzakira, H. nd *Draft PhD proposal*, Norwich: Centre for Applied Research in Education (CARE), University of East Anglia

Gunawardena, G., et al. 2002 'Employment of university graduates in Sri Lanka: the demand-supply nexus.' *Annual Academic Sessions 2002: Abstracts*, Nugegoda: Faculty of Humanities and Social Sciences, The Open University of Sri Lanka (extract pp 20-32)

Haywood, P. and Wragg, E 1982 'Evaluating the literature' *Rediguide 2*, Nottingham: School of Education, University of Nottingham. Quoted in J. Bell 1999 *Doing your own research project*, Buckingham: The Open University Press (extract pp 92)

Kumar, R. 1996 *Research methodology: a step-by-step guide for beginners*, London: Sage

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UNIT FOUR – STATISTICAL ANALYSIS

UNIT INTRODUCTION

The statistics most people are familiar with from the news, sports and books are usually about describing data. What does the average American spend on popcorn at the Movie Theatre? Statistics in educational research use data to predict things that are unknown. We can be 95% confident more people will vote for Candidate A than B.

Statistical analysis is like solving mysteries with data. We start with questions and attempt to answer them with data instead of our intuition. When we assemble enough data we make predictions. With predictions, there's always a chance that we'll be wrong. Much of statistics is understanding what we know from data we do have, making our best prediction about data we don't have, and clearly understanding the chance that we're wrong and quantifying that.

Summarizing data by describing the average or mean and the minimums and maximum is part of descriptive statistics and is the one we hear a lot on TV and sports--hence the describing of data. When we want to make predictions or infer things from data we're using inferential statistics. In inferential statistics we usually have just a subset of data, or a sample, taken from a larger group which is referred to as a population.

This unit will introduce the learn to the concepts supporting descriptive and inferential statistics.

UNIT OBJECTIVES

Upon completion of this unit you will be able to:

1. Read statistical data.
2. Perform descriptive statistical calculations.
3. Select appropriate statistical methods to support your research methodology.
4. Display statistical data in research reports.

UNIT READINGS

As you complete this unit you are required to read the following chapters/articles:

Best, J.W. & Kahn, J.V. (1995). Part Three – Data Analysis. Educational Research. Seventh Edition. New Delhi, Prentice-Hall India. p. 271 – 388. Available at: http://www.nimhindia.org/The%20meaning%20of%20research.pdf

TOPIC 4.1 – INTRODUCTION TO STATISTICS

INTRODUCTION

Using and interpreting statistics is an important skill that must be mastered by serious researchers. You will need to under statistical methods when you read the research reports of others. You will need to understand the different types of statistical approaches and how they support the research methodology. This topic will introduce you to various statistical methods.

OBJECTIVES

Upon completion of this topic you will be able to:

1. Describe what statistics are.
2. How statistics are used.
3. The basic concepts underlying statistical calculations.
4. How statistics are used in educational research.

ACKNOWLEDGEMENT

The majority of this topic was adopted from a web site tutorial provided bu www.usablestats.com. The specific reference is:

Fundamentals of Statistics 1: Basic Concepts. Available at: http://www.usablestats.com/lessons/statsintro

WHAT IS STATISTICS?

Statistics are numerical facts and figures. For instance:

The largest earthquake measured 9.2 on the Richter scale.

Men are at least 10 times more likely than women to commit murder.

One in every 8 South Africans is HIV positive.

By the year 2020, there will be 15 people aged 65 and over for every new baby born.

The study of statistics involves math and relies upon calculations of numbers. But it also relies heavily on how the numbers are chosen and how the statistics are interpreted. For example, consider the following three scenarios and the interpretations based upon the presented statistics. You will find that the numbers may be right, but the interpretation may be wrong. Try to identify a major flaw with each interpretation before we describe it?

Case 1

A new advertisement for Ben and Jerry's ice cream introduced in late May of last year resulted in a 30% increase in ice cream sales for the following three months. Thus, the advertisement was effective.

Solution

A major flaw is that ice cream consumption generally increases in the months of June, July, and August regardless of advertisements. This effect is called a history effect and leads people to interpret outcomes as the result of one variable when another variable (in this case, one having to do with the passage of time) is actually responsible.

Case 2

The more churches in a city, the more crime there is. Thus, churches lead to crime.

Solution

A major flaw is that both increased churches and increased crime rates can be explained by larger populations. In bigger cities, there are both more churches and more crime. This problem, which we will discuss in more detail in a later module refers to the third variable problem. Namely, a third variable can cause both situations; however people erroneously believe that there is a causal relationship between the two primary variables rather than recognize that a third variable can cause both.

Case 3

75% more interracial marriages are occurring this year than 25 years ago. Thus, our society accepts interracial marriages.

Solution

A major flaw is that we don't have the information that we need. What is the rate at which marriages are occurring? Suppose only 1% of marriages 25 years ago were interracial and so now 1.75% of marriages are interracial (1.75 is 75% higher than 1). But this latter number is hardly evidence suggesting the acceptability of interracial marriages. In addition, the statistic provided does not rule out the possibility that the number of interracial marriages has seen dramatic fluctuations over the years and this year is not the highest. Again, there is simply not enough information to understand fully the impact of the statistics.

As a whole these examples show that statistics are not only facts and figures; they are something more than that. In the broadest sense, "statistics" refers to a range of techniques and procedures for analysing, interpreting, displaying, and making decisions based on data.

POPULATION AND SAMPLE

If you talk to a statistician for about 15 seconds, you'll hear the term **population** and **sample** used quite a bit. A bit of explanation is in order.

If we wanted to know if a new way of teaching Algebra to 9th graders improved their test grades, we could give half of all ninth graders the new method and half the old. However, it would take quite a while and cost a lot of money to teach and test ALL ninth graders.

Instead, we could take a sample of 9th graders, give half of the sample the new method and half the old and see if the method improves scores on Algebra tests. The scores we get from our sample of 9th graders we'd use to make our best guess about the whole untested population of 8th graders. The population is all 9th graders and our sample is just the 9th graders we select for our experiment.

Populations don't have to be people or static things. In the example with the 9th grade algebra, we really have 2 populations, 1 that receives the new method and another population that doesn't. If we administered say a third type of training to another sample of 9th graders, we'd then have a third population we'd need to make inferences about.

PARAMETER AND A STATISTIC

In applied statistical work we rarely have the opportunity to measure entire populations; instead we make inferences about the populations from samples drawn, ideally randomly from the population. We usually want to know averages from whole populations, but use the average from a sample as our best guess at the population average. The unknown population average is called a parameter. The known sample average is called a statistic. It's easy to remember because of the alliteration **P**arameter: **P**opulation and **S**tatistics : **S**ample. Parameters and statistics are often means, but they could be standard deviations, medians or proportions.

For example, let's say we're interested in improving reading speed and want to test to see if a new speed-reading technique actually works while still allowing for sufficient retention of material.

We could bring in a group of 50 volunteers, teach 25 of them the new speed reading technique for 2 hours and then ask them to read some material as fast as they could, and then answer several comprehension questions. The other 25 we'd just chat with for 2 hours about sports, politics and religion and then ask them to read the same material and answer the same comprehension questions. What we want to know is if we tested everyone (half got the training and half didn't) is the average time to read the material faster for the training group and is the average number of correct questions higher for the training group? We'd have an average time to read from each group. These would be sample statistics. We'd use the average time to read to make inferences about the average time for

the entire population. The unknown average times for each group is the parameter.

As a matter of convention, most statistical texts use greek symbols for population parameters and the English or Arabic letters for sample statistics. For example, a sample mean is often denoted as x-bar $\bar{x}$. Population means are denoted with the lower-case Greek letter **mu μ** . I try and stick to that convention on this website as well (it's just a pain sometimes getting those special characters into HTML).

QUANTITATIVE AND CATEGORICAL DATA

As you'd probably guess, statistics involve using numbers from data. Not all data are the same and knowing what type of data we're dealing with will guide us through what we can do with it. The two basic divisions of data are qualitative or categorical data and quantitative or numeric data.

For example, typing speed is quantitative. Favourite colours are qualitative/categorical. Some more examples are:

Quantitative	Categorical
1. Weight in pounds	1. Model of car
2. Length in inches	2. Gender
3. Time in seconds	3. Yes or No
4. Number of questions correct on a quiz	4. Pass or Fail

DISCRETE AND CONTINUOUS

If you have quantitative data, like time to complete a task or number of questions correct on a quiz, then the data can be either continuous or discrete. Discrete data have finite values, or buckets. You can count them. Continuous data technically have an infinite number of steps, which form a continuum. The number of questions correct would be discrete--there are a finite and countable number of questions. Time to complete a task is continuous since it could take 178.8977687 seconds. Time forms an interval from 0 to infinity. You can usually tell the difference between discrete and continuous data because discrete usually can be preceded by "number of...". Here are some examples of discrete and continuous data.

Discrete	Continuous
1. Number of children in a household	1. Height of children
2. Number of languages a person	2. Weight of cars

speaks

3. Number of people sleeping in stats class
3. Time to wake up in the morning
4. Speed of the train

NORMAL, ORDINAL, INTERVAL AND RATIO

You might have heard of the sequence of terms to describe data: Nominal, Ordinal, Interval and Ratio. They were used quite extensively but have begun to fall out of favour. These terms are used to describe types of data and by some to dictate the appropriate statistical test to use. Most statistical text books still use this hierarchy so students generally end up needing to know them.

1. **Nominal** basically refers to categorically discrete data such as name of your school, type of car you drive or name of a book. This one is easy to remember because **nominal sounds like name** (they have the same Latin root).

2. **Ordinal** refers to quantities that have a natural ordering. The ranking of favourite sports, the order of people's place in a line, the order of runners finishing a race or more often the choice on a rating scale from 1 to 5. With ordinal data you cannot state with certainty whether the intervals between each value are equal. For example, we often using rating scales (Likert questions). On a 10 point scale, the difference between a 9 and a 10 is not necessarily the same difference as the difference between a 6 and a 7. This is also an easy one to remember, **ordinal sounds like order**.

3. **Interval** data is like ordinal except we can say the intervals between each value are equally split. The most common example is temperature in degrees Fahrenheit. The difference between 29 and 30 degrees is the same magnitude as the difference between 78 and 79 (although I know I prefer the latter). With attitudinal scales and the Likert questions you usually see on a survey, these are rarely interval, although many points on the scale likely are of equal intervals.

4. **Ratio** data is interval data with a natural zero point. For example, time is ratio since 0 time is meaningful. Degrees Kelvin has a 0 point (absolute 0) and the steps in both these scales have the same degree of magnitude.

DESCRIBING THE CENTRE

When data are quantitative we often want to summarize the middle or most typical value. We usually refer to this as the average. In statistics we need to be a bit more precises though as there are several averages: mean, median, mode, geometric mean, harmonic mean, winzorized mean, trimmed mean etc.

The one we should be most familiar with is the **arithmetic mean**. This is the sum of all the data divided by the number of values in the data.

The median is the mid-point of a set of data and is a better measure of the center of data when the data are skewed by large or small values. Sales price of homes, salaries of employees are examples of positively skewed data. The mean is heavily influenced by one large value, whereas the median is not.

The mode represents the most frequent value in a set of data. For example in the set of data: 3,5,6,7,7,9,8,7,5,6,4,5,3,1 the number 7 is the mode. The mode doesn't have to be the centre of a set of data and there can be more than one mode.

I've analysed a lot of data, and in my experience I use the mean about 75% of the time, then median about 14% of the time, other means like the geometric mean about 10% of the time and the mode less than 1% of the time. So get to know the mean--it's your friend.

VARIABILITY OF DATA

The centre of a distribution of data is helpful in telling you something about the most common values, but it doesn't tell you much about how spread out or variable the values are. To describe variability, we need an additional measure.

Range

An intuitive first start would be to provide the minimum and maximum values. The difference between the min and max values is called the **range**, and this is one of the simplest ways to describe the variability.

The problem with the range is that it by definition looks at the most extreme values in your data. What we want is some way of describing the average or typical distance each value is from the mean.

Standard Deviation

The most common measure of the average distance is the standard deviation. The formula for the standard deviation is below.

$$\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2}$$

It looks more confusing that what is actually happening. To get a measure of standard deviation you just:

1. subtract each value from the mean
2. square the difference score
3. add up all those squared differences scores
4. divide by the sample size.
5. take the square root.

Variance

A closely related measure to the standard deviation is the **variance**. The formula for the variance is below.

$$\sigma^2 = \frac{1}{N}\sum_{i=1}^{N}(x_i - \overline{x})^2$$

You'll notice they are very similar. In fact, the only difference between the two is that in the variance you don't take the square root of the sum of the difference scores. The variance is often used in many statistical formula, but since the values are describing the average squared-distance to the mean, its hard to understand. To make it a more intuitive measure, we take the square root so we have the typical distance each value is from the mean.

WHO CARES?

Where did this all come from you ask and why do we care? Well, the short answer is, we should care most about identifying nominal data--which is categorical data. If it isn't nominal, then it's quantitative. So why all the fuss? In the 1940's when behavioural science was in its infancy, there was much concern about trying to make the practice as legitimate as possible. Psychology and other Social and Behavioural Sciences are considered soft sciences as opposed to the hard sciences of Chemistry and Physics. It was thought that by applying some of the same thinking from the hard sciences, it would improve the legitimacy of these soft sciences--as well as the veracity of the claims made.

SELECTING STATISTICS

The choice of statistical test depends upon the **Level of measurement** of the dependent

variable (outcome). We have been describing **continuous** versus **categorical** outcome. The table below summarizes the choices for both descriptive and inferential statistics.

Level of Measurement	Descriptive statistics	Inferential statistics
NOMINAL (categorical)	Counts (frequencies) Percentages	Chi-square
ORDINAL (order, direction)	Counts (frequencies) Percentages	Chi-square
	Researchers often use INTERVAL statistics (see below) when there is a continuous measure, such as a rating scale or Likert-type items.	
INTERVAL (equal intervals)		
Normally-distributed data	Mean Standard Deviation	ANOVA (or t-test)
Not normally-distributed	Median Interquartile range	Median (hi-lo) split, then use Chi-square
RATIO (absolute zero)	As above (same as INTERVAL)	

Examples:

If the outcome measure is categorical (nominal) such as ***pass/fail*** on some test (or ***yes/no*** in response to a question), then you would use percentages to describe the outcome and Chi-square to test for significant differences.

If the outcome (dependent variable) is continuous on some measure, then you would probably use Means and Standard Deviations for description, and ANOVA to test for significant differences (assuming that the data on the dependent variable are normally-distributed in the population).

SUMMARY

This topic provides an overview of statistics and the different forms that statistical data can take. Understanding the different forms of statistics will help you as a researcher to read, interpret and select statistical methods used in different research methods and studies. The remaining topics in this unit will provide an overview of the two main forms of statistical approaches (Descriptive and Quantitative).

As a future researcher it is recommended that you complete a statistical methods course to enhance the knowledge and skills you will learn in this course.

TOPIC 4.2 – DESCRIPTIVE STATISTICS

INTRODUCTION

Descriptive statistics is the discipline of quantitatively describing the main features of a collection of data. Descriptive statistics aim to summarize a sample, rather than use the data to learn about the population that the sample of data is thought to represent. This topic will explore the creation and use of descriptive statistics.

OBJECTIVES

Upon completion of this topic you should be able to:

1. define and provide examples of descriptive statistics (frequencies, percentages, X, N, M, Mdn, Mode, SD) along with their statistical symbols
2. calculate a percentage and/or Mean, Median, and Mode from a set of scores
3. differentiate continuous and categorical outcome
4. select the appropriate statistics for continuous and categorical variables
5. distinguish between normal and non-normal (skewed) distributions, and select the appropriate statistics for each

OVERVIEW

As noted in Unit One there are two types of statistics: descriptive and inferential. **Descriptive statistics** describe the characteristics of a sample, such as the number of cases, the average score, or how spread out the scores is within the group. **Inferential statistics** are used to test hypotheses about samples. Do samples differ significantly from each other along some dimension? Or, are there significant relationships between different characteristics within each sample? Calculating statistics is the first step in transforming research data to describe your results and test hypotheses (predictions).

WHICH STATISTICS TO USE?

The choice of statistic depends on the nature of the **outcome** variable (also known as the **dependent variable** or **criterion variable**). The first question to ask in selecting appropriate statistics is whether the **values** or **levels** of the outcome variable are **continuous** or **categorical**.

Continuous Variables

A **variable** is something that changes or varies - it has different values or levels. A **continuous variable** changes along a continuum, a sliding scale of value. The values vary in amount. Examples are:

- Amount of weight gained in 1st Rate the attractiveness of ___ as a mate.

year of college
- Hours spent watching TV
- Score on the Psychology midterm
- Number of votes gained in an election

Intermediate points on the scale are meaningful, and could be measured with a sufficiently precise instrument.

Categorical Variables

A **categorical variable** changes levels in kind. It varies in type. The difference is qualitative, rather than quantitative. It varies, but not along a sliding scale of value. Examples are:

- Gender: Male, Female
- Political party: Republican, Democratic, Green, Libertarian, Other
- Class standing: Upper 1/3 vs. Lower 1/3
- Opinion: Yes, No, Undecided

The levels are discrete rather than continuous.

> **discrete** - separate, individually distinct; composed of distinct parts or discontinuous elements.

Swing Either Way

Sometimes we may want to change a categorical variable to a continuous one; e.g., a questionnaire item asking people their political orientation: Liberal, Moderate, and Conservative. These discrete levels could be put on a scale of political conservatism where 1 = Liberal, 2 = Moderate, and 3 = Conservative. The decision needs to be logical. It would not work if we had included Libertarian in our choices (Is a Libertarian liberal or conservative?).

In some situations it may be preferable to change continuous values to categories. We could take the ratings on the continuous scale of attraction shown above, and group them into categories; for example, ratings 0-2 = No; 3-7 = Not sure; 8-10 = Yes. Then we would describe how many of the responses fell in each of the 3 categories, instead of each respondent's having an individual score.

Transforming a continuous variable into a categorical one (and vice-versa)

A school district used a math test to find out whether or not students were ready for the next level. Test scores ranged from 0 to 50. The cut-off for passing is 40. The district wants to compare tenth-graders at School A with those at School B. Instead of using each student's individual score (there are hundreds of scores accumulated over the past 10 years), they set the outcome variable to whether or not the student passed the test: Yes (40 or higher) versus No (less than 40).

Assigning a sliding scale of value to categories of agreement (like this one) is often used for survey items. These values can be treated as a continuous outcome (score ranges from 0 to 4). They could also be treated as a categorical (discrete), in which case the researcher would report the number of people responding in each category.

Category:	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Scale:	0	1	2	3	4

NOTE that continuous variables can *always* be transformed into continuous variables. However, categorical variables can only be made continuous if there is an underlying scale of value.

These two ways of treating outcomes will become more clear in the next two sections.

DESCRIPTIVE STATISTICS: OUTCOME = CONTINUOUS VALUES, NORMALLY-DISTRIBUTED

These statistics are used for describing research results when the outcome variable is measured along a sliding scale of value (continuum), and when the values of the outcome variable are likely to be normally-distributed in the population. You will learn what "normally-distributed" refers to when you complete the tutorial listed below under Standard Deviation.

Descriptors for Samples

1. **Sample size** (***N***) - the number of cases, (e.g., persons or individuals in the sample). Use lower case ***n*** for noting subsets (smaller groupings within the sample), such as

Male (***n***=5), Female (***n***=7); the total is ***N*** = 12. These symbols (e.g., ***N***, ***M***) are italicized in APA style (the official guide to presenting results).

2. **Central tendency** - the average score. There are 3 measures of central tendency: the **Mean (*M*)**, **Median (*Mdn*)**, and **Mode**. You need to know how to calculate central tendency from:

    - raw data (**raw** = "uncooked," or untreated scores, the score on a test, etc.) frequency distributions.

3. **Variability** - shows the spread or dispersion of scores within the sample. Two measures of variability are the **Range** and **Standard Deviation (*SD*)**. The Range is simply the difference between the highest and lowest score in a distribution. Like the Mode, it is easy to understand, and will not be discussed further.

STATISTICS FOR NORMAL DISTRIBUTIONS

Mean (central tendency) - the most useful measure of central tendency**,** sometimes abbreviated as $\bar{X}$. It is the arithmetic average. Add up the scores and divide the sum by the number of cases (or individuals) in the sample. The formula is shown below:

$$M = \frac{\Sigma X}{N}$$

Σ = sum of

X = raw score

ΣX = sum of all raw scores

N = number of cases

> This formula is the **unbiased estimate** of ***SD*** (distinguished by ***N***-1 in the denominator). Some calculators have 2 formulas. The unbiased estimate is the larger of the two calculations (they will not differ by much).

The Mean provides important information about a sample. However, it does not tell us anything about the ***spread*** of scores. Are the scores close to one another? Or are they spread out?

Standard Deviation (variability) - a complex, but common, measure of variability

reaction time - the time it takes an individual to respond to some stimulus.

The tutorial gives you the reasoning behind the Standard Deviation. The main thing to remember is that ***SD*** indicates spread. The larger the ***SD***, the more spread out the individual scores are from the Mean. Here is the formula.

$$SD = \sqrt{\frac{\Sigma X^2 \quad \frac{(\Sigma X)^2}{N}}{N-1}}$$

ΣX^2 = each score squared and then summed

$(\Sigma X)^2$ = sum the scores and square the total number of cases

Even if you don't fully understand the concept, you can calculate ***SD*** using the formula. NOTE: You do **not** need to memorize the formula. You **do** need to be able to use it (i.e., plug in the appropriate numbers and do the calculations that are indicated by the formula).

This is good place to stop, review, and test your knowledge so far.

DESCRIPTIVE STATISTICS: OUTCOME = CONTINUOUS VALUES, NON-NORMAL (SKEWED)

Some characteristics are not normally distributed in the population (as described in the preceding section and tutorial). One example is reaction time. There is a physical limit as to how fast one can be. Scores tend to pile up at the fast end. A few people will be very slow and their scores will be at the slower end. This produces a skewed distribution. It will not resemble a normal (bell-shaped) curve.

A non-normal distribution affects the Mean, making it less representative of the sample (Remember what an extremely-high scoring person does to a class average?)

reaction time - the time it takes an individual to respond to some stimulus.

skewed distribution - distribution of scores that deviates markedly from a

normal curve.

For a skewed distribution, the **Median (*Mdn*)** is a better indicator of central tendency. Mdn is the midpoint among ordered scores -- half (50%) of the scores are above the Median, and the other half (50%) are below. It is not as affected by extreme scores as is the Mean.

Note: a sample may be skewed, but it is OK to use ***M*** and ***SD*** if you can assume that the **dependent variable** (outcome) is normally distributed in the population from which the sample is drawn (i.e., forms a normal bell-shaped curve.

DESCRIPTIVE STATISTICS: OUTCOME = CATEGORICAL LEVELS

These statistics are used for analyzing research results when the levels of the outcome variable are categorical (discrete, non-continuous). The main calculation is **frequency of occurrence** or **observed frequencies**, by category (counts by outcome level). Then, the frequencies are transformed into **percentages** for final presentation.

Contingency Table

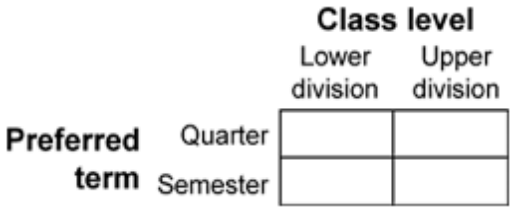
The first step in analyzing outcomes that are categorical (e.g., Yes vs. No, Low vs. Medium vs. High) is to enter the frequencies (counts) in a contingency table. A contingency table is a grid or matrix of cells, each one representing a value or level of each variable in the study. Example of a contingency table:

Dependent variable (outcome)	Independent variable (predictor) Level 1	Level 2
Level 1	A	B
Level 2	C	D
Level 3	E	F

There can be as many rows and columns as you need. Each little box is called a **cell**. The independent or predictor variable is shown at the top, with the outcome along the side.

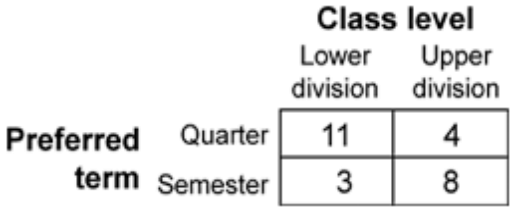
Letters (A, B, ...) = counts in respective categories

The following example shows the results of a poll of college (lower division vs. upper division) students' preferences for quarter versus semester terms.

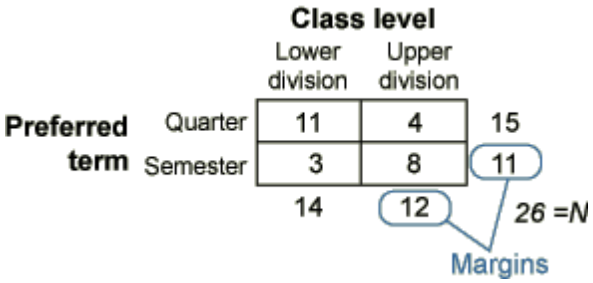


Step 1. Create a table for the data. Being in the upper left-hand cell indicates a lower division student who prefers the quarter system.

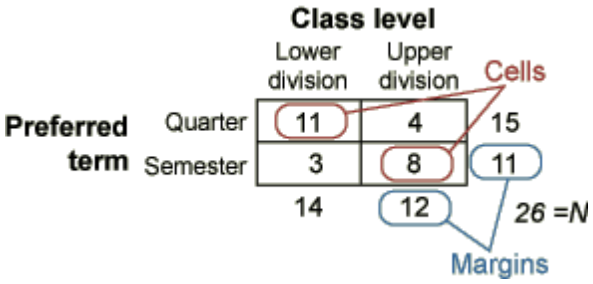
The table is called a ***contingency table*** because being in a particular cell is ***contingent*** upon the levels of the independent and dependent variables.



Step 2. Enter the appropriate numbers in the cells. In this example, 11 of the lower division students prefer the quarter system (term), 3 prefer semester, etc.



Step 3. Sum all the rows and columns. These are called the **marginal** totals. The **grand total** (***N***) is 26.



Here is the table (or matrix) with the cells and margins labeled. In this example, *N* = 26, Lower division *n* = 14, Upper division *n* = 12 (use lower case to indicate sample size of the subgroups).

Percentages

		Class level: Lower division	Class level: Upper division
Preferred term	Quarter	78.6%	33.3%
	Semester	21.4%	66.7%
		100%	100%

Percentages are a good way to summarize the contingency table data. Change the counts to percent.

11/14 = .786 = 78.6%

4/12 = .333 = 33.3%

3/14 = .214 = 21.4%

8/12 = .667 = 66.7%

SUMMARY

Descriptive statistics are numbers that describe the characteristics of a sample. Different statistics are used, depending on whether the outcome variable is continuous or categorical.

Continuous Outcomes

N refers to **sample size** and should always be included along with the other appropriate statistics.

Central tendency: The **Mean (*M*)** is the arithmetic average of a set of scores. The **Median (*Mdn*)** is the midpoint of a distribution of scores. The **Mode** is the most frequently-occurring score, and the least useful indicator of central tendency.

Variability: The **Range** is a simple measure indicating the distance from the highest to the lowest score. The **Standard Deviation (*SD*)** indicates the spread of scores in relation to the **Mean** and is the most useful indicator of dispersion (spread or variability).

When continuous data are **normally-distributed**, the most appropriate descriptive statistics are the Mean and Standard Deviation (along with N). For **non-normal (skewed)** distributions, use the Median.

Categorical Outcomes

Categorical data (**counts or frequencies** in discrete categories) are placed into a **contingency table**. Most often, the descriptive statistics are **percentages**.

Continuous variables can always be transformed into categorical ones, although some information will be lost (i.e., individual scores).

TOPIC 4.3 – INFERENTIAL STATISTICS

INTRODUCTION

In most cases an **inferential statistic** is used to test some hypothesis. Do groups differ on some outcome variable? Is the difference more than would be expected by chance? Can one factor predict another? You don't need to understand the underlying calculus, but you do need to know which inferential statistic to use and how to interpret it.

OBJECTIVE

Upon completion of this topic you will be able to:

1. Understand the concepts supporting inferential statistics.
2. Read research articles that employ inferential statistics.
3. Complete simple inferential statistics calculations.

ACKNOWLEDGEMENT

The following source should be acknowledged as providing the majority of content for this topic.

University of California Davis. (n.d.). Inferential statistics: Introduction. Psychology Department Web Site. Available from http://psychology.ucdavis.edu/sommerb/sommerdemo/stat_inf/intro.htm.

NULL HYPOTHESIS (H0)

In many cases the purpose of research is to answer a question or test a prediction, generally stated in the form of **hypotheses** (**-is**, singular form) -- testable propositions. Examples:

Question	Hypothesis
Does a training program in driver safety result in a decline in accident rate?	People who take a driver safety course will have a lower accident rate than those who do not take the course.
Who is better in math, men or women?	Men are better at math than women.
What is the relationship between age and cell phone use?	Cell phone use is higher for younger adults than for older adults.
Is there a relationship between	Income increases with years of education.

education and income?

Can public education reduce the occurrence of AIDS?	The number of AIDS cases is inversely related to the amount of public education about the disease.

The statistical procedure for testing a hypothesis requires some understanding of the **null hypothesis**. Think of the **outcome** (dependent variable). From a statistical (and sampling) perspective), the null hypothesis asserts that the samples being compared or contrasted are drawn from the same population ***with regard to the outcome variable***. This means that

- any observed differences in the dependent variable (outcome) must be due to sampling error (chance)
- the independent (predictor) variable does NOT make a difference

The symbol **H0** is the abbreviation for the null hypothesis, the small zero stands for ***null***.

Oddly enough, we are in a sense betting against our research judgment. If we didn't think that some factor made a difference, we probably would not be doing the research in the first place. But statistically speaking, we temporarily adopt the critical stance that our independent variable does NOT matter.

Generally, when comparing or contrasting groups (samples), the null hypothesis is that the ***difference between means (averages) = 0***. For categorical data shown on a contingency table, the null hypothesis is that any differences between the observed frequencies (counts in categories) and expected frequencies are due to chance.

RESEARCH HYPOTHESIS (H1)

The **research hypothesis** (or hypothes***es*** -- there may be more than one) is our working hypothesis -- our prediction, or what we expect to happen. It is also called the **alternative hypothesis** - because it is an alternative to the null hypothesis. Technically, the claim of the research hypothesis is that with respect to the outcome variable, our samples are from ***different*** populations (remember that **population** refers to the group from which the sample is drawn). If we predict that math tutoring results in better performance, than we are predicting that after the treatment (tutoring), the treated sample truly is different from the untreated one (and therefore, from a different population).

The research or alternative hypothesis is abbreviated as **H1**, and if there are more hypotheses, **H2**, **H3**, **H4**, etc.

WHY THE NULL HYPOTHESIS (H0)?

When we pose a research question, we want to know whether the outcome is due to the treatment (independent variable) or due to chance (in which case our treatment is probably not effective). For example, the claim that tutoring improves math performance generally does not predict exactly how much improvement. Each level of improvement has a different probability associated with it, and it would take a long time and a great deal of effort to specify the probability of each of the possible outcomes that would support our research hypothesis.

> **Extraneous Factors** - factors (variables) in addition to the independent variable, that might be affecting the dependent variable (outcome).

On the other hand, the null hypothesis is straightforward -- what is the probability that our treated and untreated samples are from the same population (that the treatment or predictor has no effect)? There is only one set of statistical probabilities -- calculation of chance effects. Instead of directly testing H1, we test H0. If we can reject H0, (and extraneous factors are under control), we can accept H1. To put it another way, the fate of the research hypothesis depends upon what happens to H0.

Here are some **research** or **alternative hypotheses** (testable statements)

- Exercise leads to weight loss
- Exposure to classical music increases IQ score
- Extroverts are healthier than introverts
- Sensitivity training reduces racial bias

The inferential statistics do not directly address the testable statement (research hypothesis). They address the **null hypothesis**. Statistically, we test "not." Here are the null hypotheses:

- Exercise is unrelated to weight loss.
- Exposure to classical music has no effect on IQ score.
- Extrovert and introverts are equally healthy.
- People exposed to sensitivity training are no more tolerant than those not exposed to sensitivity training.

NOTE: The null hypothesis is NOT the opposite of the research hypothesis. The null hypothesis states that any effects observed after treatment (or associated with a predictor variable) are due to chance alone. Statistically, the question that is being answered is "If

these samples came from the same population with regard to the outcome, how likely is the obtained result?"

Self-test - Hypothesis

State the null hypothesis for the following propositions. The answer is on the next page.

1. The incidence of depression is higher for men than for women.
2. On the playground, more children play on the swings than on the slide.
3. Women are more irritable in the premenstrual phase of their cycle than at other times.
4. A high score on the test of spatial ability predicts success as an electrician.

Here are some null hypotheses. What do you think the research hypothesis for each might be?

5. Preference rates for blue cars was the same as preference rates for green ones.
6. With regard to social behaviour, any observed differences between cats and dogs are due to chance.
7. There are no racial differences in intelligence.

Sources of Error in Research

Inferential statistics are used to make generalizations from a sample to a population. There are two **sources of error** (described in the Sampling module) that may result in a sample's being ***different*** from (not representative of) the population from which it is drawn.

These are:

Sampling error - chance, random error

Sample bias - constant error, due to inadequate design

Inferential statistics take into account **sampling error**. These statistics do ***not*** correct for sample bias. That is a research design issue. Inferential statistics only address random error (chance).

ANSWERS TO SELF-TEST (FROM PREVIOUS PAGE)

Proposition	Null Hypothesis
1. The incidence of depression is higher for men than for women.	There is no difference in rates of depression.
2. On the playground, more children play on the swings than on the slide.	On the playground, children use the swings as often as they use the slide.
3. Women are more irritable in the premenstrual phase of their cycle than at other times.	Women's level of inability does not vary across menstrual cycle phase.
4. A high score on the test of spatial ability predicts success as an electrician.	Being a successful electrician is unrelated to spatial ability (as measured on the test).
5. Preference rates for blue cars was the same as preference rates for green ones.	Compared with green, blue is the more preferred colour for a car.
6. With regard to social behavior, any observed differences between cats and dogs are due to chance.	Dogs are more social than cats.
7. There are no racial differences in intelligence.	Some racial groups are more intelligent than others.

P VALUE

The reason for calculating an inferential statistic is to get a *p* **value** (**p** = probability). The **p** value is the probability that the samples are from the **same** population **with regard to the dependent variable** (outcome). Usually, the hypothesis we are testing is that the samples (groups) differ on the outcome. The **p** value is directly related to the **null hypothesis**.

The ***p*** value determines whether or not we reject the null hypothesis. We use it to estimate whether or not we think the null hypothesis is true. The ***p*** value provides an estimate of

how often we would get the obtained result by chance, if in fact the null hypothesis were true.

- **If the *p* value is small, reject the null hypothesis** and accept that the samples are truly different with regard to the outcome.
- **If the *p* value is large, accept the null hypothesis** and conclude that the treatment or the predictor variable had no effect on the outcome.

DECISION RULES - LEVELS OF SIGNIFICANCE

How small is "small?" Once we get the ***p*** value (probability) for an inferential statistic, we need to make a decision. Do we accept or reject the null hypothesis? What ***p*** value should we use as a cut-off?

In the behavioural and social and sciences, a general pattern is to use either .05 or .01 as the cut-off. The one chosen is called the **level of significance**. If the probability associated with an inferential statistic is equal to or less than .05, then the result is said to be ***significant at the .05 level***. If the .01 cut-off is used, then the result is ***significant at the .01 level***.

Type I Error - rejecting the null hypothesis when it is true.

Using the .05 level of significance means if the null hypothesis is true, we would get our result 5 times out of 100 (or 1 out of 20). We take the risk that our study is ***not*** one of those 5 out of 100. Rejecting or accepting the null hypothesis is a gamble. There is always a possibility that we are making a mistake in rejecting the null hypothesis. This is called a **Type I Error** - rejecting the null hypothesis when it is true. If we use a .01 cut-off, the chance of a Type I Error is 1 out of 100. With a .05 level of significance, we are taking a bigger gamble. There is a 1/20 (5 out of 100) chance that we are wrong, and that our treatment (or predictor variable) doesn't really matter.

Why would we take the bigger gamble of .05 rather than .01 cut-off? Because we don't want to miss discovering a true difference. There is a trade-off between overestimating and underestimating chance effects.

You will often see the probability value described as ***p < .05***, meaning that the probability associated with the inferential statistic is .05 or less (5 out of 100).

Notation used with ***p*** values:

< = less than
> = greater than
≤ = less than or equal to
≥ = greater than or equal to

When you use a computer program to calculate an inferential statistic (such as a ***t***-test, Chi-square, correlation), the results will show an exact ***p*** value (e.g., ***p*** = .013). If you use the formulas for hand calculation, you will need to use a table of critical values in order to get ***p***. Instructions are provided in the Methods Manual listed in the left navigation bar.

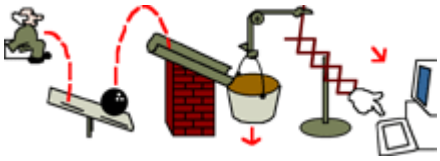
SELF-TEST: INTERPRETING *P*

Here are some research results. Using a .05 level of significance, would you reject the null hypothesis and conclude that there is a difference in the following cases?

Proportion of girls categorized as early-maturers: California versus Arizona, ***p*** <.05	??
Degree of agreement with the statement "All in all, it was worth going to war in Iraq." Republicans vs. Democrats, ***p*** = .035	??
Rating of overall liking of movie: Film club members vs. non-club members ***p*** = .173	??
Difference in reaction time between those consuming alcohol and those not, ***p*** <.001	??
Number of lawn signs for candidates: Winner vs. loser, ***p*** = .025	??
Degree of agreement with the statement "By law, abortion should never be permitted." Women vs. Men, ***p*** > .05	??

See next page for answers

Steps for testing hypotheses



1. Calculate descriptive statistics
2. Calculate an inferential statistic
3. Find its probability (***p*** value)
4. Based on ***p*** value, accept or reject the null hypothesis (H0)
5. Draw conclusion

Answer to Self-Test (From Previous Page)

Proportion of girls categorized as early-maturers: California versus Arizona, ***p*** <.05	Reject null hypothesis. Conclude that there is a significant different at the .05 level between the groups of girls.
Degree of agreement with the statement "All in all, it was worth going to war in Iraq." Republicans vs. Democrats, ***p*** = .035	Reject the null hypothesis. Conclude that there is a difference between Republicans and Democrats on this item at the .05 level of significance.
Rating of overall liking of movie: Film club members vs. non-club members ***p*** = .173	Accept the null hypothesis and conclude that there was no difference between the two groups with regard to their overall liking of the movie.
Difference in reaction time between those consuming alcohol and those not, ***p*** <.001	Reject the null hypothesis and conclude that there is a significant difference in reaction time at the .001 level (.91 would be OK aslo).
Number of lawn signs for candidates: Winner vs. loser, ***p*** = .025	Reject the null hypothesis and conclude that the winner had significantly more lawn signs (assuming that was the direction of the difference).
Degree of agreement with the statement "By law, abortion should never be permitted." Women vs. Men, ***p*** > .05	Accept the null hypothesis and conclude that men and women do not differ in their level of agreement with this statement.

Outcome = Continuous, Normal Distribution

The following procedures apply when the outcome varies along a continuum, and can be assumed to be normally distributed in the population being sampled. If you are testing a hypothesis about an outcome with categorical or discrete levels, see the section on Categorical outcomes.

Analysis of Variance (ANOVA)

ANOVA is the statistical procedure used for comparing or contrasting **Means** (averages) from samples (groups). It uses the information that goes into the **Mean** and the **Standard Deviation**.*

median (***Mdn***) - midpoint of a distribution when all the scores are arranged from highest to lowest. Half the scores fall above the median and half below.
Interaction - the outcome produced by changes in one factor differs depending upon the levels of the second factor.

An Analysis of Variance requires at least one independent variable with at least 2 levels. A research design with one independent variable is termed a **single factor** ANOVA. If there are two or more independent or predictor variables, then it is called a **factorial** design.

Calculating ANOVA by hand takes a long time. It is best to use a computer program (***Excel*** works if you have the Data Analysis module installed).

If you are contrasting only two groups, you can use a ***t-test*** instead of ANOVA (think "***t*** for two.") For 2 groups, a ***t-test*** gives the same result, and is fairly easy to calculate by hand.

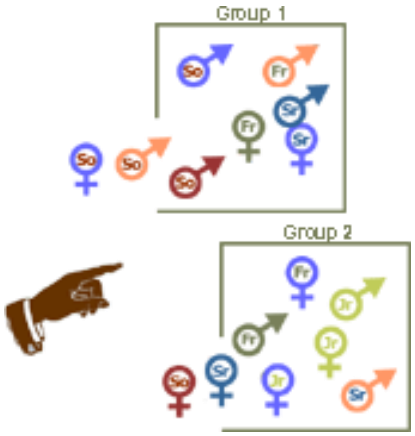
You will not be expected to do an ANOVA by hand. The goal is for you to know:

- which procedure to select for the computer program (data entry will depend on the program used - most likely will be in the form of a spread sheet)
- how to interpret the printout

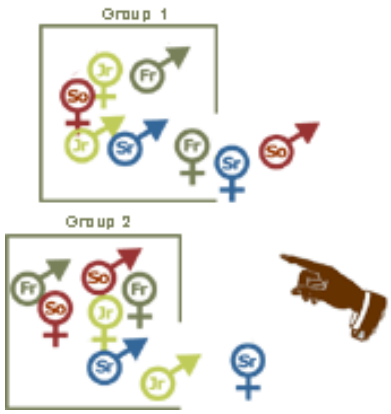
TWO TYPES OF ANOVA

Independent groups - two different sets of individuals In the graphic below, college students are randomly assigned to Groups 1 and 2.

Paired samples (sometimes referred to as Repeated Measures or With Replication**)** - either the same individuals or from matched groups (i.e., matched on everything but the treatment (level of the Independent variable).



Example: Researchers are interested in exam anxiety. They administer an anxiety inventory to students just before the final exam in a Sociology class. They also administer it before the final exam in a Political Science class. To compare the two sets of scores, they use either ANOVA (Excel) or t-test for independent samples (hand calculation).

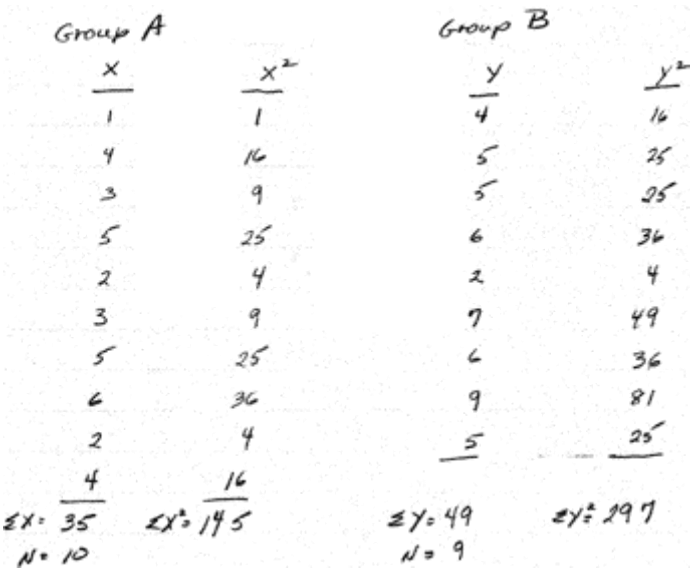


Example: Researchers are interested in exam anxiety. They administer an anxiety inventory on the second day of class. Then they give it again on the day of the midterm. To compare the two sets of scores, they use either ANOVA with replication (Excel) or t-test for paired samples (hand calculation).

METHODS MANUAL: *T*-TEST - HAND CALCULATION

FOR INDEPENDENT SAMPLES*

- List the raw scores by group
- Calculate the sum of the scores for the first group (ΣX) and for the second group (ΣY) (columns 1 and 3).
- Square each individual score and sum those for each group, ΣX^2 and ΣY^2 (columns 2 and 4)



Group A		Group B	
X	X^2	Y	Y^2
1	1	4	16
4	16	5	25
3	9	5	25
5	25	6	36
2	4	2	4
3	9	7	49
5	25	6	36
6	36	9	81
2	4	5	25
4	16		
$\Sigma X = 35$	$\Sigma X^2 = 145$	$\Sigma Y = 49$	$\Sigma Y^2 = 297$
$N = 10$		$N = 9$	

- Use the following formula to calculate the ***t-ratio***.

$$t = \frac{M_X - M_Y}{\sqrt{\left[\frac{\left(\Sigma X^2 - \frac{(\Sigma X)^2}{N_X}\right) + \left(\Sigma Y^2 - \frac{(\Sigma Y)^2}{N_Y}\right)}{N_X + N_Y - 2}\right] \cdot \left[\frac{1}{N_X} + \frac{1}{N_Y}\right]}}$$

Σ= sum the following scores

M_X= mean for Group A

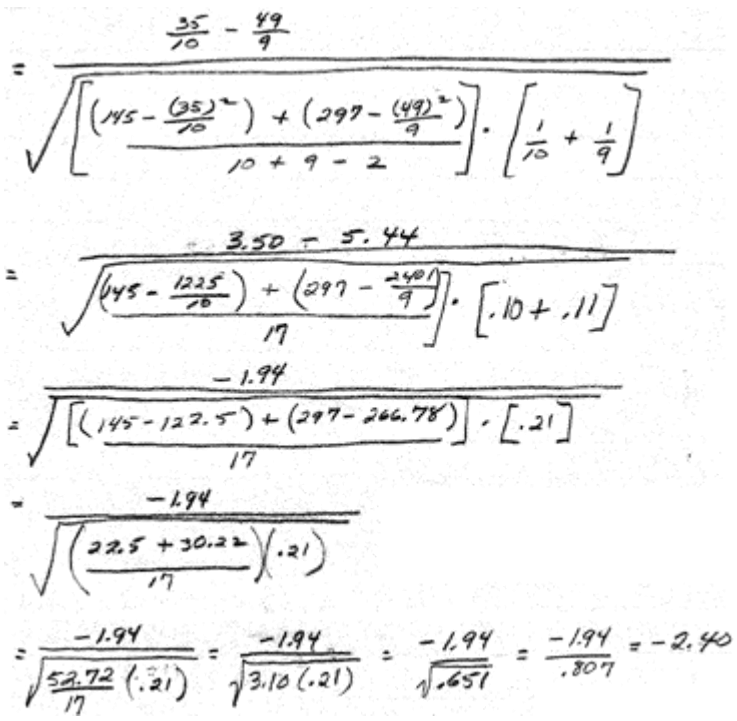
M_Y= mean for Group B

X = score in Group 1

Y = score in Group 2

N_X= number of scores in Group 1

N_Y= number of scores in Group 2



matched groups - assigning subjects so that the experimental and control groups are as similar as possible. A means of controlling extraneous variables.

- Find the probability value (***p***) associated with the obtained ***t-ratio*** of -2.19.

  a. Calculate degrees of freedom (***df***)

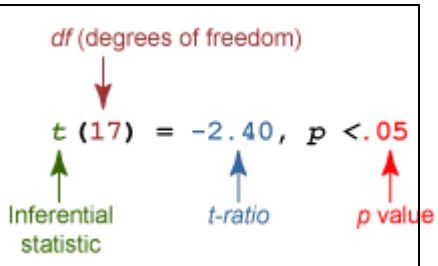
  $$df = N_X - 1 + N_Y - 1$$

  $$df = (10-1) + (9-1) = 17$$

  b. Use the abbreviated table of Critical Values for ***t-test*** to find the ***p*** value.

For this example, ***t*** = -2.40, ***df*** = 17. The obtained value of 2.40 exceeds the cutoff of 2.11 shown on the table at the .05 level. Therefore, ***p*** <.05. In a report the result is shown as ***t***(17) = -2.40, ***p***<.05.

A ***plus*** or ***minus*** sign at the end, associated with the ***t-ratio***, indicates the direction of the difference between the means (Group B had a higher mean than Group A). The ***p*** value remains the same in either direction. Here is the outcome in statistical terms:



* If you have matched samples (i.e., the two sets of scores are from the same individuals or from matched groups), you must use a different formula.

METHODS MANUAL: *T*-TEST - HAND CALCULATION FOR PAIRED SAMPLES*

- List the raw scores by group
- Subtract each Y score from each X score (***d***).
- Square each ***d*** and sum.

Anxiety score

regular day	exam day	d	d^2
16	32	-16	256
3	22	-19	361
17	23	-6	36
3	13	-10	100
19	20	-1	1
15	29	-14	196
24	11	13	169
23	25	-2	4
3	13	-10	100
12	20	-8	64
32	30	2	4
		-86	$\Sigma d^2 = 1291$
		+15	
		$\Sigma d = -71$	

N of pairs = 11

- Use the following formula to calculate the ***t-ratio***.

$$t = \frac{\frac{\Sigma d}{N}}{\sqrt{\frac{\Sigma d^2 - \frac{(\Sigma d)^2}{N}}{N(N-1)}}}$$

d = difference between matched scores
N = number of ***pairs*** of scores

- Find the probability value (***p***) associated with the obtained ***t-ratio***.

$$t = \frac{\frac{-71}{11}}{\sqrt{\frac{1291 - \frac{(-71)^2}{11}}{11(11-1)}}}$$

$$= \frac{-6.455}{\sqrt{\frac{1291 - \frac{5041}{11}}{11(10)}}}$$

$$= \frac{-6.455}{\sqrt{\frac{1291 - 458.27}{110}}}$$

$$= \frac{-6.455}{\sqrt{\frac{832.73}{110}}}$$

$$= \frac{-6.455}{\sqrt{7.57}} = \frac{-6.455}{2.75} = -2.35$$

- Calculate degrees of freedom (***df***)

df = ***N*** (number of pairs) - 1
df = 11-1 = 10

- Use the abbreviated table of Critical Values for ***t-test*** to find the ***p*** value.

For this example, ***t*** = -2.35, ***df*** = 10. The obtained value of 2.35 exceeds the cut-off of 2.11 (***df*** = 17, nearest ***df*** shown on the table) at the .05 level. Therefore, ***p*** <.05. In a report the result is shown as ***t***(17) = -2.35, ***p***<.05.

A plus or minus sign at the end, associated with the ***t-ratio***, indicates the direction of the difference between the means (anxiety was higher on exam day). The ***p*** value remains the same in either direction.

* If you have independent samples (i.e., two different groups of subjects), you

must use a different formula.

INTERPRETING THE ANOVA RESULT

The ANOVA statistic is called *F* or ***F*-ratio**. Here is an example of a single-factor ANOVA. The factor (variable) is a scenario with 2 levels about willingness to go on a date.

> **Variable = Scenario**: He is a public policy analyst who works for a prestigious law firm. He likes Monday night football with friends, is an avid skier, and likes jazz. He is somewhat reserved, but has a good sense of humor. He is nice looking, dresses neatly, and is courteous.

Level 1
A group of 10 women are shown the above paragraph and asked to rate the likelihood on a scale of 1 (not at all likely) to 10 (very likely) that they would date the man described.

Level 2
A second group of 10 is shown the same description, with one modification - "works for a prestigious law firm" is replaced with "works for a non-profit agency."

Here are the descriptive statistics showing the results.

One of the 10 women gave an unclear response, resulting in only 9 usable responses for the second group.

Table 1.
Likelihood of date (1=low, 10=high)

Workplace	Mean	SD	N
Non-profit agency	3.50	1.58	10
Prestigious law firm	5.44	1.94	9

Research question: Does the ***M*** = 3.50 differ from ***M*** = 5.44 more than would be expected by chance?

Think of drawing several samples of 10 from a population from of 5,000. The population mean (average) is 4.0. The sample means (averages) probably will not be exactly 4.0. A few might be 4.0, but other sample means will fluctuate due to chance. Some samples may have M = 3.97, or M = 4.06, etc. They will vary around the true population mean of 4.

The research question is whether the difference observed between sample means is

greater than would be expected by chance (e.g., M = 2.3 versus M = 5.4 in the above situation).

The **Means** are based on two different groups of respondents. Therefore, we would do a single factor ANOVA for independent groups (samples) to see if the difference between the group means is greater than would be expected by chance.

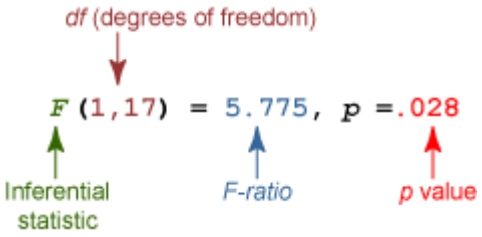
Take a look at the raw data on the next page (and the setup for a computer analysis).

Raw data for date study

Subject	Group	Rating
1	A	1
2	A	4
3	A	3
4	A	5
5	A	2
6	A	3
7	A	5
8	A	6
9	A	2
10	A	4
1	B	4
2	B	5
3	B	5
4	B	6
5	B	2
6	B	7
7	B	6
8	B	9
9	B	5

This is how you would set up the data for computer analysis.
The independent variable (or factor) is **Group**. It has 2 levels: A and B.
The outcome or dependent variable is **Rating**. Its levels or values can range from 1 to 10.

After running the analysis, the computer printout provides the following information:



You will need to familiarize yourself with the characteristics of the computer program that you use. All of this information (F-ratio, df, and p) will be provided somewhere in the output.

In the dating scenario analysis, ***F*** = 5.775. This ***F-ratio*** is the inferential statistic, but it is not our final goal. It is a step along the way. What we are after is *p*, a probability estimate. The ***p*** value is what determines whether or not we accept our hypothesis of a difference (if needed, review the Introduction section for a brief discussion of probability levels).

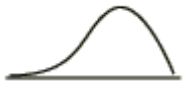
Recall that the general rule in the behavioral sciences is to reject the null hypothesis if the probability associated with the appropriate statistic is less than .05. In this example ***p*** equals .028 (which is less than .05). Therefore, we reject the null hypothesis and accept the research hypothesis that the treatment (man's type of employment) made a difference.

Looking above at the **Means** shown in Table 1, we conclude that women are more likely to date the man working at a prestigious law firm than at the non-profit agency. The above statistical information (without the colorful, informative labels) would be included in the report. For more details about presentation, see Methods Manual in the Report writing module.

On to statistics for continuous, non-normal distributions

- ANOVA compares the difference ***between*** Means against the variability (spread of scores) ***within*** each sample. The within-sample variability provides an estimate of chance variation. If the difference ***between*** sample Means is significantly greater than the ***within-sample*** variability, we conclude that our samples differ on the outcome variable. The reliance on estimating variability gives the procedure its name, Analysis of ***Variance***.

Outcome = continuous, non-normal (skewed) distribution



In the Descriptive statistics module it was pointed out that the ***Mean*** and ***Standard Deviation*** are not good statistics to use for skewed distributions (i.e., distributions of scores that are not normally distributed). The preferred measure of central tendency is the **Median** (*Mdn*).

When you have a distribution with a few very extreme scores, a safe way to analyze the results is to change the outcome from a ***continuous*** variable to a ***categorical*** one (this gets around the problem of a non-normal distribution). Changing a continuous outcome to a categorical one is done by splitting the scores at the **Median**. The result is a count -- # of high scorers versus # of low scorers. That goes on a contingency table. Then use **Chi-square** to see if there is a difference.

For example, in comparing history majors versus math majors on their liking of drama, instead of using their liking ratings, you would

1. calculate the median liking score for the entire group (the grand median)
2. count the number of history majors above and below the grand median
3. count the number of math majors above and below the grand median
4. create a 2x2 contingency table

		MAJOR	
		History	Math
DRAMA	High liking (Mdn and above)		
	Low liking (below Mdn)		

More ....

CALCULATE CHI SQUARE

For many categorical outcomes, the appropriate statistic to use is **Chi-square** (χ^2). It is easy to calculate by hand from a contingency table. All statistical software packages include Chi-square (***this is not a misprint -- it is not Chi-squared, even though it looks that way***).

Using a contingency table (see the Chi-square statistic is based on the difference between the **observed** frequencies (the raw data - the counts in the cells) and the frequencies **expected** by chance (based on the marginal totals).

Example: The hypothesis is that lower division students are more likely to prefer the quarter system, and upper division students prefer semesters. Below is the contingency table. Do NOT use percentages in the contingency table calculations.

		Class level: Lower division	Class level: Upper division	
Preferred term	Quarter	11	4	15
	Semester	3	8	11
		14	12	*26 =N*

Rationale for calculating expected frequencies (to give you a sense of the underlying statistics, you do not need to memorize it:

1. There are 14 lower division students.
2. There are 26 participants in the survey.
3. Of the 26 participants, 15 students prefer the quarter system.
4. Based on the marginal totals, 14/26 (proportion of lower division students in the sample) of 15 (total number preferring the quarter system) = the number of lower division students would be expected to prefer the quarter system.
5. From this reasoning, the Expected frequency (E) = (14/26)*15 = **8.08**.
6. The **Observed frequency (O)** = **11**

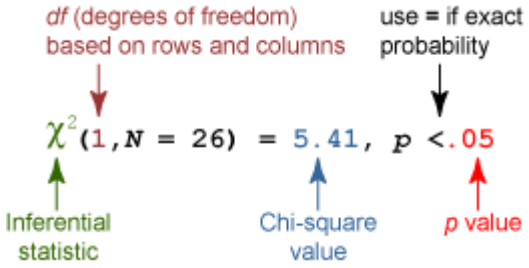
INTERPRETING THE CHI-SQUARE STATISTIC

Chi-Square Formula

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

O = Observed frequency
E = Expected frequency
Σ= Sum of above across all cells

For the survey results, χ^2 = **5.41**. This Chi-square value is our inferential statistic, but it is not our final goal. It is a step along the way. What we are after is its *p* **value** - ***p*** is a probability estimate. The ***p*** value is what will determine whether or not we accept our hypothesis that the two groups of students differ in term preference.



Here is the way the statistical result is displayed in a report (without the colourful, informative labels).

Accepting Or Rejecting The Null Hypothesis

As noted previously, the general rule in the behavioral sciences is to reject the null hypothesis if the probability associated with the appropriate statistic is less than .05. In this example, ***p*** is less than .001 (which is considerably less than .05). Therefore, we will reject the null hypothesis and accept our research hypothesis that there is a difference in term preference between the two groups.

From the descriptive statistics, we see that the lower division students prefer the quarter (64%) with more of the upper division (53%) students preferring the semester. The inferential statistic tells us the difference is greater than expected by chance.

	Class level (predictor variable)	
Preferred term (outcome)	Lower division	Upper division
Quarter	78.6%	33.3%
Semester	21.4%	66.7%

Summary

Inferential statistics are used for making inferences from samples to populations. For research purposes, their primary use is to test hypotheses. They provide an estimate of **random error** (chance). Inferential statistics do NOT correct for **sample bias** (constant error which results from poor design).

The statistical procedure actually tests the **null hypothesis**. The null hypothesis is that with respect to the outcome, the samples being compared come from the same population; that any differences in outcome between the groups being compared are due to chance. In other words, the independent variable (treatment or predictor) has no effect on the dependent variable.

The inferential statistic provides a ***p*** value - the likelihood of the result *if the null hypothesis were true*. When the obtained *p* is less than .05 (or sometimes .01), we reject the null hypothesis. When the null hypothesis is rejected, the alternative, or research hypothesis is accepted.

When the null hypothesis is accepted (*p* greater than .05), we conclude that the independent (treatment) or predictor variable had no effect on the outcome.

The characteristics of the outcome variable determine which inferential statistic is appropriate:

- When comparing or contrasting **Means**, use ANOVA (either for independent or paired scores).
- If the distribution is skewed and **Medians** are used instead of Means to describe the samples, then use the grand Median to convert the continuous measures into counts in categories, and use Chi-square to analyse the results.
- If the outcome variable is **categorical** (rather than on a continuous scale of measurement), use Chi-square.

UNIT SUMMARY

Statistical methods and analysis is an essential skill that all researchers must master. It is recommended you take on statistical methods or purchase one or more books on statistical methods. Below are some recommended textbooks that you should consider:

De Veaux, R.D., Velleman, P.F. & Bock, D.E. (2014). Intro Stats. 4th Edition. Pearson Publishing.

Vogt, W.P. (2007). Quantitative Research Methods for Professionals in Education and Other Fields. Pearson Publishing.

Huck, S.W. (2012). Reading Statistics and Research. 6th Edition. Pearson Publishing.

UNIT FIVE – WRITING A RESEARCH REPORT

UNIT INTRODUCTION

Often researchers report that the fun part of their study is the data collection and analysis process. The analysis output results in a series of findings and recommendations. But another important part of the research process is reporting your research findings and recommendations to the larger education community. Reporting your research can be done in variety of ways. It can be in form of a research report, article for a peer reviewed journal or as a thesis or dissertation to illustrate your research skills. This final unit in the course will provide some guidelines on how to report your research effort.

UNIT OBJECTIVES

Upon completion of this unit you will be able to:

1. Write a research report.
2. Employ appropriate methods of citation.
3. Display data in forms that clearly illustrate their impact on your research.

UNIT READINGS

As you complete this unit you are required to read the following chapters/articles:

Best, J.W. & Kahn, J.V. (1995). Chapter Three – The Research Report. In Educational Research. Seventh Edition. New Delhi, Prentice-Hall India. p. 61 – 80. Available at: http://www.nimhindia.org/The%20meaning%20of%20research.pdf

TOPIC 5.1 – WRITING THE REPORT

INTRODUCTION

As a researcher you have spent considerable time and effort in planning and conducting your research. You have gathered and analysed your data, identified your findings and made your own conclusions. But you still need to report your research results to others. This topic deals with many of the aspects of writing up research findings. It will explore the complexities of writing a research report and/or journal article.

OBJECTIVES

Upon completion of this topic you should be able to:

1. Distinguish between description, analysis and interpretation in your own and others' work.
2. Make an outline plan of your draft report, with a schedule for writing it.
3. Plan your main arguments clearly and logically.
4. Identify and use structuring devices in your writing.

OVERVIEW

For those who have not already written research reports, this may seem a huge and difficult task. However, think of it as a story; you are going to address your audience and:

1. tell them what happened (description);
2. explain how and why these things happened (analysis); and
3. help them to understand the implications (interpretation).

That is the structure that we will follow in this topic.

Consider, in your own research and note your intended audience(s) and make notes on the following:

1. What important information about your research situation which will be new to them?
2. What kinds of things are you planning to explain to them?
3. What insightful and valid interpretations of the situation will you give to them?
4. What kinds of recommendations for action would be appropriate in this case?
5. What proportions of your report are likely to fall into the three categories of description, analysis and interpretation?

THREE ASPECTS OF RESEARCH REPORTING

All research reporting involves description and analysis, and most research reports also include some interpretation:

- **description** tells what happened;
- **analysis** tells the relationships and patterns you found; and
- **interpretation** tells what you or others think the research means and how to use it.

How much space should you give to each of these elements? Each report differs. If little is known about the situation, or what is known turns out to be incorrect, your real contribution is description, so that section will take up a greater proportion of your report. Description is also useful to show how all the pieces fit together, that is, to present a holistic picture of a situation. For example, we have little detailed information about daily life in refugee camps; if you were researching the possibilities of setting up open and distance learning in such a place, you might need to include quite detailed descriptions of the situation to show the potentials and problems of ODL programmes.

If the facts are clear enough, but people do not know how to relate them to one another and to make sense of them, your biggest contribution will be analysis, and that will form the major section of your report. Traditionally, quantitative research provided a lot of material for analysis and convenient statistical tools for doing it, so quantitative researchers gave this part of the report a greater emphasis, but qualitative researchers can do this as well by boiling down data into categories, patterns, typologies, and so on. For example, if you were looking at problems of drop-out in ODL the analysis will show who leaves, under what circumstances, and why.

If people want to know what you or others who are participating in the research think the analysis means, you will spend more time on interpretation. People who take an interpretive approach will emphasise this section, and examine the perspectives of all those involved and the meanings they attach to them. People with a lot of experience can bring insights to bear in reaching beyond the material at hand to speculate, suggest implications, and challenge theory. For example, after undertaking a case study of a particular ODL programme, you might have a chapter showing in what ways it is innovative, in what ways it goes back to traditional roots, and what lessons can be drawn from the case study for other ODL providers.

Recommendations are a form of interpretation. Practical constraints, ideological and political considerations, diplomacy and common sense also enter into the process of making recommendations. Analysis may show a finding to be statistically significant, but that has nothing to do with it being important. You have to use your judgement to decide whether it means anything, and what, if anything, should be done.

Adapted from Kane, E. 1995 Seeing for yourself: research handbook for girls' education in Africa, Washington: Economic Development Institute, World Bank pp 289-90

Different Kinds Of Reports And Presentations

Your findings may be presented in many different forms, depending on your audience. Here is a preliminary classification:

Table 1 A classification of report types

Type	Formats	Audiences
Written	Academic reports, e.g. journal article, conference paper, thesis	Academics
	Policy papers	Administrators, directors, government departments
	Evaluation reports	Funders, participants, decision-makers
	Action research accounts	Colleagues and participants
Oral presentations	Workshops, conferences, public meetings	Small audiences
Print	Handbooks, manuals	Practitioners
Mass media	Radio, television, web-sites	Mass audiences

If you take seriously what was said earlier, you may well find that you need to produce more than one type of report for more than one set of stakeholders. Our advice is to draw up a full written report first; it is easier to shorten and adapt afterwards when you are sure of what you want to say. You will almost certainly find your ideas become clearer the more you write. What at the beginning needed three pages to explain, you can later summarise as one paragraph!

Structuring a Research Report

A full research report will probably contain most or all of the following. Each section can be made longer or shorter according to the audience and the purpose.

Common Elements of a Research Report

At the start

- title page
- list of contents, tables and figures
- acknowledgements of help received, including financial help.

Executive summary

This gives a short summary of the key information and main findings in a format which is easy to read. It often uses headings, numbered short paragraphs and bullet points.

Abstract

This is a one-paragraph summary, used in journals instead of an executive summary.

Introduction and overview

This sets out why the research was undertaken, and states clearly the problem, the area of enquiry, or the research questions. The final section gives a brief overview of the rest of the report, stating what can be found in each section or chapter.

Background information

This gives factual information which the reader may need in order to understand the situation being researched. It is particularly important when writing for an audience that is unfamiliar with the place or the subjects of the research.

Literature review

A literature review places the research in the context of similar work carried out by others. It is particularly important for an academic report, but it may be useful for any audience to understand what is already known or thought about the study area.

Research design and methods

This explains briefly how you designed the study, the basic research approach/methodology, the population and sampling (if appropriate), and the methods used. Examples of the instruments (questionnaires, interview schedules, observation charts, etc.) should be placed in appendices. You should include a section on 'limitations' i.e. what you were not able to do, or things that went wrong.

Findings

This is the main part of the report and may be divided into several sections or chapters. Here you describe and analyse what you found, as clearly and succinctly as possible. It is often useful to take each problem, area of enquiry or research question in turn, and give the findings related to each. Commentary and interpretation can either be added as you go along, or reserved for a later section. (Units 3 and 4 deal in more detail with this.)

Discussion

How much discussion is needed depends on your audience, and on whether you have already commented on the findings as you went along. This is where you will give your interpretations of the data. An academic audience will expect you to relate what you found to the literature, and to aspects of theory. A more practically-oriented audience will need to know how your findings can be implemented. For any audience, you should point out any gaps or unanswered questions, and highlight new questions and issues that have arisen in the course of your study.

Conclusions and recommendations

The concluding section or chapter will summarise the findings and relate them back to the problem or research questions outlined in your introduction. It should also restate any key issues raised by the research. Finally, where appropriate, it should set out a short, clear list of things you believe, on the basis of your research, should be done.

References

This is a list of all the sources mentioned or cited in your text, set out according to academic conventions.

Appendices

The appendices include material that may be of interest to some readers, but which is too detailed or bulky to go in the report. Examples are: research instruments, extra details of the sample, or of case-studies, extracts from relevant documents.

ACTIVITY – REPORT WRITING

This activity will help you to get started with the preliminary planning of your report.

1. Study the headings outlined above.
2. Make very short notes about what you might include in your own report in each section. Record your notes in your personal journal.
3. Invite a colleague or your instructor to comment, if possible.

WHAT HAVE YOU GOT ALREADY?

Before starting to write, collect together all the materials you have produced so far. If you have followed earlier modules, you will already have much draft material for your report. For example, you may have:

1. your research proposal, with the rationale and some review of literature.
2. summaries of information drawn from documents.
3. your research journal, with periodic analytical memos outlining issues that have emerged, patterns you have noted, and preliminary conclusions.
4. complete first level analyses of data you have collected. Quantitative data will be in the form of frequency tables, cross tabs, etc.. Qualitative data may have included condensed versions of interviews, themed analyses, comparative matrices, etc.
5. Collect your material together.
6. Reread it and remind yourself of what you have found out.
7. Then think of your audience and what they need to know. This is an iterative process. While constructing your report you should be moving between the two.

WHERE TO START?

Though everyone should draw up an outline along the lines shown above, few people would write the report in this order! Here are some suggestions on the order in which you might write:

Good places to start

Some components are self-contained and can be written separately, at almost any time. For example:

- **the background information**. Tailor this to the needs of the specific audience
- **research design and methods**. Redraft what was in the research proposal, to match what actually happened. Keep it factual, clear and short. Add a reflective component if appropriate
- **the literature review**. Redraft this from the research proposal, expanding, adding or summarising depending on your audience and purpose
- **the rationale and aims** (part of the Introduction). Rephrase if necessary from the research proposal.

The findings and discussion

The findings and discussion are the heart of the report and can only be written when the data has been analysed. If possible, set aside a period of relatively unbroken time when you can write and complete at least the first draft of these sections.

The conclusions

The conclusions should obviously be done at the end, but so should the full introduction and overview. The beginning and the end of the report need to be consistent with each other and with the rest of the report: one sets out what you intended to do, the other summarises the story and points forward. A busy reader should be able to get the main points of your study by reading the first and last chapters only!

ACTIVITY – RESEARCH SCHEDULE

This activity will help you begin to get a sense of the schedule that you will need for your report.

1. Draw up a time plan for writing your own report, showing in which order you would like to draft the components.

2. Writing the text.

3. Choosing a voice.

4. First decide whether you will use the first or third person. Formerly reports were mainly written in the third person e.g. 'The researcher considers that the problem can be solved by …' Today it is perfectly acceptable to use 'I' or 'we' e.g. 'I concluded that the main reason for the large student drop out was …'

5. An alternative is the use of the impersonal passive voice e.g. 'The sample was selected from …' or 'It was found that a large number of students …' The passive is sometimes useful for describing factual aspects, or in putting forward recommendations, but I would personally avoid it in the discussion and interpretation sections.

6. The choice may depend on your audience. An action research report, telling colleagues how you improved your own practice, sounds much better in the first person. In a policy paper for a minister, or an evaluation report, a more impersonal style might be appropriate. Many academic articles use a combination of voices.

7. As you practise writing you will develop your own style. Writing your research journal will have helped.

8. Writing clearly.

9. It is not necessary to use long words or academic jargon when reporting research. Short sentences are nearly always better than long ones. However, this does not mean that your thinking is shallow. Complex ideas can be expressed in short sentences and straightforward words.

10. To write in this way, you need to be very clear in your own mind what you want to say. You need to choose exactly the right words, which make the connections between your ideas clear. Each sentence has to mean something in its own right and at the same time should contribute to the flow of the paragraph.

11. Paragraphs should not contain more than one or two main ideas. Good writers often use key sentences at beginning of paragraphs, or sometimes at the end. These sentences indicate the key point that is being made in that paragraph.

Record your results in your personal journal.

ACTIVITY – WRITING ANALYSIS

This activity will give you some practice in making a piece of text easier to read, without any loss of authority or meaning.

1. Read the text sample below. It uses far too many words, some of it is repetitive, it uses long words where short ones would do, and it is written in the third person.

2. Rewrite the text in the first person, using more but shorter sentences, and just including the main points and necessary information.

3. Record your proposed change in your personal journal.

(It would be useful to do the exercise with one or two other people and compare your results before looking at the feedback.)

The Sample Text

The original notion for the present enquiry had its roots in the concern expressed by a number of participants at a formal review meeting, who counted among their number not only the present author and her collaborator but also many people from the ranks of the university administration, those responsible for the curriculum delivery, and even representatives of the students from different courses and departments.

Having consulted extensively in the literature, it is the view of the authors that the amount of effort expended on delving into the multifarious causes of unsatisfactory retention rates and on attempting to ascertain through in-depth enquiries factors implicated in the departure of students before the completion of their courses is not commensurate with the illumination achieved by the results. Notwithstanding the fact that these undertakings have been pursued with diligent efforts, utilising all varieties of research methodologies, it

transpires that the causes vary with local or national location and specific contexts, so that the exact conditions pertinent to successful completions remain obstinately obscure. It is therefore important to state that it was decided as a result of the meeting that several concurrent research studies should be carried out, funded by the University, into the exact nature and causes of the problems that had been identified above.

ORGANISING YOUR THOUGHTS

The following is a physical way of organising your thoughts.

Write down on separate slips of paper the key points you want to emerge from your report. These could be ideas, concepts, findings, conclusions. You may find you have a few big main ones and smaller subsidiary ones linked to them. Move these around on the table until you find a suitable order. You may end up with a concept map, a linear structure, or other patterns. If you like, write linking sentences showing how they relate to one another. As your report is a linear structure, you need to decide on the order in which you will deal with them.

This can be done at any stage: before you start, or in the middle of writing to clarify your own thinking, or at the end to check the coherence of what you have written. In the latter cases, you can use copies of headings, key sentences or even paragraphs, and see if they would be better in a different order. If you are using a word processor, it is easy to move them around in your file afterwards.

Logical Argument and Coherence

This is a key aspect of good report writing and the most difficult to achieve. The writers should take the readers along a well-defined pathway towards a clear goal. For this to happen, two things are important. Firstly, the writers must themselves have a clear idea of where they are going and what they want to say at each stage. Secondly, they must signal directions to the readers. This involves putting themselves in the readers' position – thinking again of the audience.

Brainstorming

Start by brainstorming. Write down the ideas as they come to you, fitting them together roughly. Then revise, adding and subtracting, moving them around until your ideas become clearer. Then work them into a linear structure which will give you an outline for your written argument.

Concept Mapping

Next, draw a concept map. This will help you see how your ideas fit together and where the logical connections are. Here, for example, is a concept map for this topic.

Study Tip: Concept Mapping

A concept map is a free-style diagram which shows a number of key points, or topics, and how they are related to one another.

Useful links

http://www.graphic.org/
http://www.coun.uvic.ca/learn/program/hndouts/class1.html

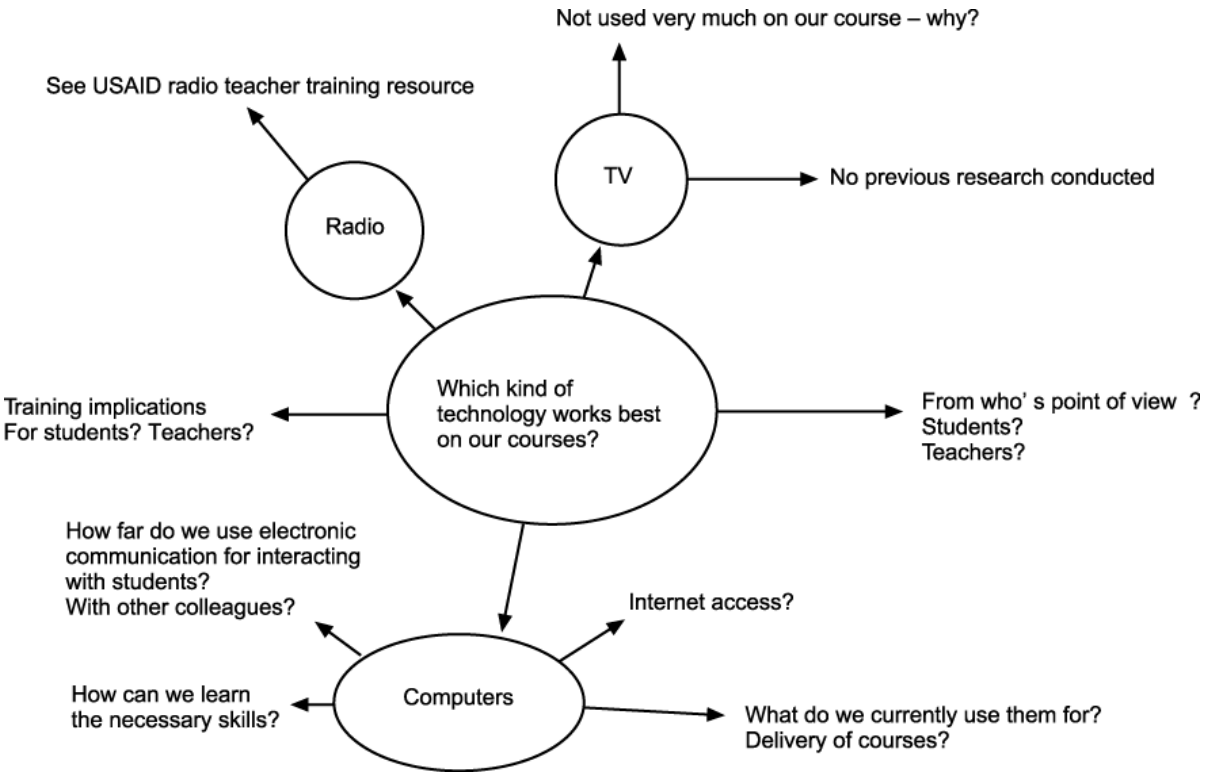


Figure - An example of a concept map

SHOWING YOUR STRUCTURE TO YOUR READERS

There are lots of ways in which you can help your readers to follow your argument. Here are a few:

- At the start of the report, and perhaps at the start of each chapter or section, you can give a short overview: *In this section we shall look at …*
- At the end of each section you can summarise what you have said, and if you want to, point forward to the next one. *We can therefore say that …* Or *To conclude …*
- Signal the order of your points by using: *firstly, secondly, thirdly* etc.
- Point up comparisons and contrasts by phrases like: *On the one hand … On the other…*or *By contrast, we found that …*
- Remind the reader of earlier points, or indicate where you are going next: *As noted above …* or *I shall refer to this below …*
- If you do want to take a diversion, signal it with such phrases as*: I am now going to consider the special case of …* And then: R*eturning to my main argument, this shows that …*

USE HEADINGS

The use of headings can help structure the argument for both writer and reader. They can act as 'advance organisers' indicating what is coming. Two or three levels are helpful – more can be confusing –and can be signalled using different fonts and/or by numbering.

Example

Level 1 Chapter 3: Research Design and Methods

Level 2 3.2 Use of Sampling
The study used both random and stratified samples

Level 3 *3.2.1.Sample of Students*
This was selected as follows …

This is relatively easy when using description, as above. It is less obvious in the analysis and interpretation sections. However, using such hierarchical headings will force you to consider which of your ideas are the main, or key points, and which are the subsidiary points.

Improving Your Draft

Very few writers get it right first time. Be prepared to revise even three or four times.

Ask other people to read your draft. People who could be helpful include:

- **colleagues and/or stakeholders** who know the situation – they could suggest, for example, what you have left out, where the emphasis could be changed, where they note bias;
- **outsiders** –they can comment on how well you have explained the situation to them, what other information is needed, and how it fits into what is known more generally; and
- **experienced writers/editors** – they can help with style and accuracy.

(Such help should be acknowledged at the beginning or end of the report.)

SUMMARY

In this topic you learned that:

1. reports need to contain description, analysis and interpretation in appropriate combinations;
2. there are certain standard components of reports, which can be combined and used in different ways, at different lengths;

3. different components can be written at different times and in various order;
4. the author needs to find an appropriate voice, write clearly, and pay particularly attention to logical arguments and coherence; and
5. the text can be structured using various techniques to guide the reader.

TOPIC 5.2 - DISPLAYING DATA IN REPORTS

INTRODUCTION

In this topic we will consider the processes of preparing data for use in your reports. We emphasise the need to condense, select, and combine data, and to create displays in order to make it easy for the reader to understand. We show how words and numbers, text and displays, are used to reinforce the message. We discuss some ways of working with both quantitative and qualitative data of various kinds, including interviews, observational data and surveys.

OBJECTIVES

When you complete this topic you should be able to:

1. Summarise and present quantitative data in tabular or diagrammatic form.
2. Select and use quotations appropriately.
3. Find ways of presenting clearly observational data and information from documents.
4. Report survey data succinctly.

OVERVIEW

One big problem in presenting findings is how to make clear to the reader (or the listener) where the results have come from. You have to steer between two extremes: on the one hand overloading the text with tables and quotations, and on the other giving so little information that the reader cannot see how you came to your conclusions. Your analysis and conclusions must be clearly grounded in the data. You do not need to put in every scrap of evidence, but you do need to show the extent of the ground covered, including the awkward data that don't fit easily into the conclusions!

The key words for working with data are:

CONDENSE

SELECT

COMBINE

DISPLAY

All your data will be going through recurring processes of selection and condensation. You have seen how to begin this process in earlier modules and you should already have some first level analyses to work on.

ITERATION

Another important activity is iteration. You need to be continually going between your data on the one hand, and on the other your research questions and the report you want to write.

You will have studied your results so far, and written short analytical memos, summarising what you have found, noting anything unexpected, or contradictory findings. The memos will indicate which of the research questions have been answered, what remains unclear, and what other issues have been raised. You will be thinking in terms of description, analysis and interpretation.

Can I mix words and numbers?

Yes, you may and indeed you should! As you have seen in earlier modules, many researchers mix quantitative and qualitative research methods, and you may have done the same.

If your data is mainly qualitative, you can and should still use numbers. For example, you should indicate the approximate numbers or proportions of those you observed or interviewed who fall into different groups, or who hold certain views. Suppose you have interviewed 20 tutors and 40 students, asking them about their perceptions of a certain course. You might be able to say:

'While 40% (8) of the tutors interviewed mentioned 'language difficulties' as one of the main student problems, only 15% (6) of the students referred to problems with reading and writing.'

If your data is mainly quantitative, it needs to be summarised, explained and interpreted in words. Rather than repeating the exact figures given in a table, you can use phrases more easily grasped and remembered, giving approximate results. You might say:

'From Table X it can be seen that over three-quarters of the students passed all their courses in Year 1. In Year 2, this dropped to two-thirds. Just under a quarter of these had A or B grades.'

Triangulation: The use of more than one method in collecting data on a particular event.

If you have used several methods you should bring them together to show how they confirm, or perhaps contradict, each other. This is known as triangulation. For example, data from a survey and from interviews on the same topic, and even with the same people, can throw up very different perspectives. Unit 4 has some examples.

WORKING WITH QUANTITATIVE DATA

In some ways quantitative data are simple to handle. Your statistical analysis software will have provided you with the results you need – always providing you have asked the right questions and used the correct statistical analyses! It will create some kinds of tables and diagrams for you.

However, you have now to decide which are the most appropriate for your report. Which results are the most important for your analysis and conclusions, and how can these be presented in ways your audience will understand?

Tables

Tables need to be as simple as possible, consistent with your purpose. If you are preparing a report for a government department or a donor agency you can use sophisticated and complex tables, and include details of the significance levels. On the other hand, if you are writing for a lay audience, make the tables simpler – with no more than 5–6 rows or columns and clear headings – banishing the details of the calculations to an appendix.

You may need to create tables yourself from your frequency data. In this way you can combine results, simplify the categories, round up the figures and generally make the data more user-friendly.

The example below shows how survey results from three cohorts of primary teacher trainees were combined to make a point about the usefulness of teaching practice (TP) as perceived by students at different stages in their careers. The accompanying text is both analytical and interpretative.

Example 1

Table - Students' perceptions about the usefulness of teaching practice

TP should be?	Current students	Exiting students	Newly qualified teachers
Longer	48% (43)	47% (30)	41% (29)
Same length	42% (38)	40% (26)	36% (26)
Shorter	10% (9)	13% (8)	23% (16)
Totals	**100% (90)**	**100% (64)**	**100% (71)**

Contrary to our expectations based on the general literature, teaching practice is not always seen as the highlight or most useful part of the course. While at the point of exit students thought it had been very useful, the NQTs gave it a somewhat lower usefulness rating. Comparing data from these two surveys with data from the teaching practice study of current students, we see a consistent trend for students as they progress to think teaching practice is less important. From this we could infer that while students need practice, it is not essential that this take place while in college; supervised training in the NQT year might be just as useful.

Diagrams

Many people can understand quantitative data more easily if it is presented visually. You have already seen examples of ways of displaying data in the quantitative module. The important points to bear in mind when choosing a display method are:

use a **bar-graph** rather than a table e.g. for showing people's ages.

use a **line-graph** rather than a sequence of numbers for showing a trend over time.

a **pie-chart** is a good way of showing proportions, such as the amounts of money spent on different things, or the numbers of people coming from different provinces. It works best with between 4–7 categories.

Study tip: numbers and percentages

Always show both, as in the above example, so the reader is quite clear about the magnitude of the group. In a very small sample, 50% might only refer to 3 people, and that might be misleading!

All such displays need a brief text, above or below the display, which summarises the information verbally. It should also point out any anomalies in the data and indicate what is missing. This just enhances its descriptive powers. But the text can also provide an analysis, by highlighting certain aspects and explaining some of the connections. This may lead into some interpretation.

This activity will help you to think about the relative advantages of tables and other display methods.

WORKING WITH QUALITATIVE DATA

If you have been interviewing or observing you will have a lot of verbal data in the form of interview transcripts and observation schedules or notes. Perhaps you will have visual data as well in the form of photographs, or sketch maps.

Use of quotations

Quotations can be used to give an authentic flavour to your descriptions, to illuminate or highlight an analytical point. They can also be used to show typical comments or views, or to show unusual or extreme positions – the 'outliers'. Sometimes – if you are lucky – someone will have said something that summarises or encapsulates a common perspective of the group.

You can use paragraph-long quotes, indented, or you can include in the text shorter quotes, sentences or even significant phrases. These need to be highlighted in some way, by quotation marks or use of italics. The example below shows how interview data (from 20 college lecturers) was condensed down into themes, and used to illustrate the tutors' views. In the example, italics has been used to give emphasis to a summary statement, and the rest of the quotes are in quotation marks.

Example - Personal theories

We sought through the interviews to elicit something of their own personal or lay theories about teaching and learning as these might have developed over the years.

There emerged a rather technical view of training, apparently shared by most interviewees, which goes something like this: we tell the students what to do, let them practice it, and they should be able to do it. Learning to teach often seems to be treated as quite unproblematic: 'when one has enough content plus teaching strategies, he can disseminate it'. The role model theme reappeared as well. One explained, 'they need residential training so we can shape them by our instruction and example'. Possibly the old DPTE training contributed to this consensus, as two tutors specifically quoted things they had learnt there. There was little evidence of tutors' independent reflection, though two said 'one keeps on learning'. One tutor was more explicit, explaining how she developed ways of making trainees use the methods they would have to use in the primary school, 'they teach each other, and little by little they will learn'.

Stuart, J., Kunje, D. and Lefoka, J. 2000 'Careers and perspectives of tutors in teachers training colleges: case studies of Lesotho and Malawi', MUSTER Discussion Paper No 16, Centre for International Education: University of Sussex. Available from http://www.sussex.ac.uk/usie/muster/pdf/mpd_16_11_02.pdf

If there is an long piece of text which exemplifies something particular and which needs to be read as a whole, such as a classroom sequence, then it can be put in an appendix.

Do not use too many quotes!

Choose quotes that illustrate your findings and contribute to your argument. Just as with the tables and diagrams, the quotations need to be introduced or followed by text that explains and/or interprets the words.

Activity - Quotations

This activity will help you to select quotations with care and use them to good effect.

1. Read the extract below. (In the extract, university teaching in two countries is being compared; it is a fictitious example based on a real case-study. Country A is a low-income country with very large classes and traditional teaching methods. Country B is an industrialised country with much better resources, allowing smaller classes, where 'progressive' methods are possible.)
2. Make notes on which quotations are most pertinent to the argument.
3. Rewrite the passage, using only 3 of the quotes, and adding some comments relevant to the problems illuminated here.

Record your response in your personal journal.

Extract - Pedagogy in the College (Version 1)

As I mentioned earlier when discussing my classroom observations in Country A, the great amount of theoretical knowledge in the curriculum, and the large numbers of students, combine to make lecturing the prevailing method used. This is revealed from data gathered from both students and faculty members.

Student teachers commented:

It is very rare that we talk to the lecturers in the sessions, as there are a very large number of students. And if we want to talk and ask questions, most of the lecturers say that it is a waste of time to interrupt them to do so. We can ask questions at the end of the lecture, but as soon as the lecture finishes the lecturer vanishes.

We listen all the time to our professors throughout the whole course. In the educational courses we are allowed to provide our points of view. But we very seldom do so.

In some sessions we discuss or answer some questions in groups, but it is not worth it. Because our number is more than a hundred in small sessions and up to four hundred in lectures.

A Faculty member commented on this saying:

Honestly speaking, we cannot use any other method than lecturing, because there are so many students in each session, which does not encourage anyone to use another method.

Another one said:

My lectures are attended by up to 400 students at a time. If I allow them to participate I cannot cover all the material in the curriculum.

In Country B by contrast, my observations show that tutors use a variety of teaching strategies in order to keep students' attention, participation and involvement. One tutor summed this up when she told me:

Using different teaching strategies serves a number of purposes. Firstly, it motivates students. Secondly, we show them in practice what they can do in their classroom. Thirdly, teaching is a creative profession which needs imagination and creativity, and this is what we are trying to show to the students.

Students need to see different teaching strategies in order to be able to pick up the one that suits their teaching environment.

VIGNETTES

These are like the 'pen portraits' that we used in *Module 1* and the *User Guide*. They are descriptions of typical individuals rather than of one actual person, though they may be given (fictitious) names for easy reference. They will have been created out of all the data given in interviews and perhaps observations as well. Here is an imaginary example that Venkamma might use after studying her prisoners:

Example - Vignettes

Saeed is in his late forties. He is illiterate and has been in and out of prison several times for various minor offences. He expresses polite interest in courses, but soon loses interest. His psychological profile suggests he has mild learning disabilities.

Ahmed completed secondary school. He is in prison for theft. He identified several subjects he wanted to study, saying that once he had intended to go to college. The prison officials noted he reads whatever materials he can get his hands on.

Mehta is very angry about being in prison and does not believe the authorities care about him or his needs. He expresses no interest at all in education.

These names can then be used in discussing the possible strategies for introducing distance education into the prison. For example: 'If more staff were available, then Ahmed could be offered regular teaching …'

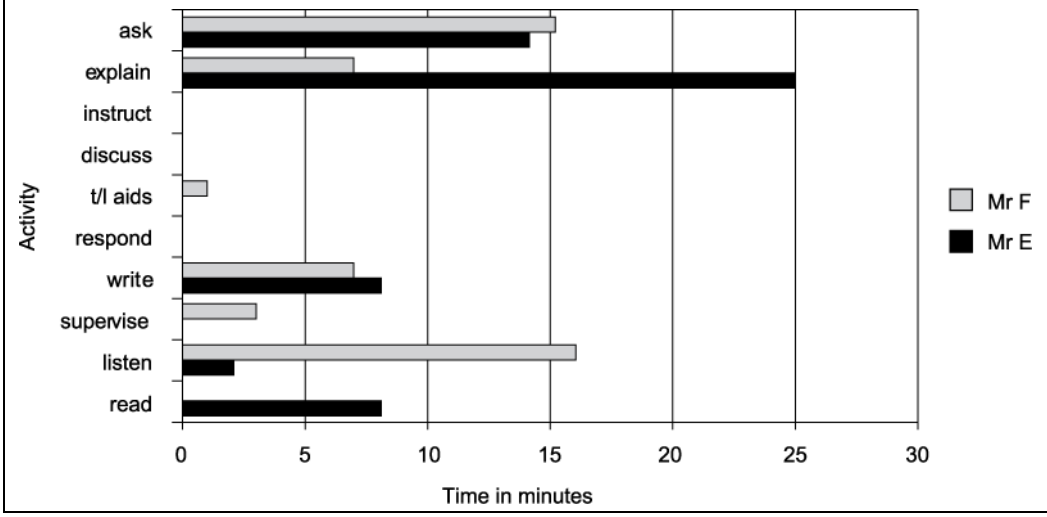
USING OBSERVATIONAL DATA

Observational data can just be summarised. Or you can include a short section of classroom interaction that illustrates a point. In the extract below, note that the interaction has also been summarised quantitatively. You can see an example of this in *Kane*, which is in the *Resources File*. You can see there how the observational data are summarised in a table.

Example Observational Data

You can invent your own methods of turning events into graphics. This example is a visual summary of classroom interaction in a teacher training college during a mixed mode course.

It was derived from a timed observation schedule, which recorded the activities of tutors and students at each minute intervals. While it may not be perfectly accurate – and the coding presented some problems – it shows vividly how one tutor spent far more time interacting with his students, and listening to them, than the other one did. This illuminated the analysis that most teaching was highly didactic and most classes were very passive; Mr. F. was an exception.



Other Methods

You can also draw maps or include photographs.

REPORTING SURVEY DATA

Surveys can produce masses of data! How do you select what to put in your report? You certainly do not need to include full details of the answers to every question or you will end up with yet another 'catalogue'. The watchwords are again: **condense, combine, select**. Go to and fro between your research aims and questions, and the data, deciding what is significant, what is not.

At this stage you should have the first level analysis or semi-processed materials from your survey. That is, your numerical data will have been analysed, giving you frequencies, cross-tabs, and the results of statistical tests. Open-ended questions will have been coded and summarised in tabular form, with illuminating quotes noted separately.

Here are some ways to reduce the data.

- combine answers to several questions in one table;
- combine results from different surveys to show comparative figures, or changes over time – see Example above; or
- summarise basic data as bullet point statements – Example 5 (below) shows a great deal of information in an easily read format.

Example 5 – Overall characteristics of the entering teacher trainee

The overall characteristics of the entering primary teacher trainees can be summarised as follows. Trainees:

- are mainly female
- are mainly in the age group 21-30 years
- are mainly single
- have taught for 3-4 years prior to entry into the colleges
- have taught mainly at government-assisted schools
- possess more than 5 CXC/GCE* O-level passes
- typically have not passed 3 CXC/GCE O-level science subjects
- typically do not possess GCE A-level passes
- come from homes in which the mothers are mainly house persons; the fathers operate at the lower professional, skilled and semi-skilled levels; and few of the parents possess post-secondary qualifications.

The profile of trainees seems to be changing as older people and a greater percentage of married people seem to be entering teaching.

*Caribbean Examinations Council/General Certificate of Education i.e. the school-leaving exam.

SUMMARISING FROM DOCUMENTS

In this section we look at how to make the best use of the factual evidence you have gathered for your research project: curriculum documentation, course outlines, assessment procedures, internal working papers, and so on. Much of this information is detailed, and often hard for outsiders to understand. But you may need to condense, summarise and

simplify at least some of it when providing the necessary background and contextual information for your report.

Your aim should be to provide the necessary information in the clearest and simplest way possible. Much background information can best be presented in tabular form rather than in continuous text. For example, you can set out in a table the main details of an institution: numbers of staff, of students, courses, etc. You can summarise the main elements of a programme or a course on one side of A4. Or you could tell its history as a time-line.

Example – Summarizing

The table below sets out key information about two colleges.

Table - Key information about two colleges

	College A	College B
Date of foundation	1963	1975
Ownership/management	Roman Catholic Church	Ministry of Education
No. of students on full-time residential courses	485	2115
No. of students on part-time distance learning	–	6550
No. of teaching staff	24	143
No. of programmes currently taught	2	25

Example Summarizing

The table below shows an example of a timeline for Open University X.

Table - An example of a timeline

Date	Event	Approx. student numbers
1926	Found as overseas college of the University of London	250
1965	Became constituent college of the National University of Polevedia	1500
1975	Granted independent status as Polevedia Polytechnic	2500
1990	Opening of Department of External Study (correspondence courses)	4000
1996	All departments required to set up distance learning programmes	7500
2000	Became Polevedia Open University with a brief to make ODL available throughout the country.	12,000+

ACTIVITY – SUMMARIZING DATA

This activity will give you practice in selecting and displaying tabular data.

Draft a tabular summary of some key features of your own institution, or the one where you have carried out your research. It should be designed to give a reader from another country the necessary background information to understand your report.

Insert your summary in your personal journal

SUMMARY

In this topic you have learned about:

1. the importance of condensing, selecting, combining and displaying data in order to show clearly and succinctly where the findings have come from;
2. writing text to accompany figures, and including numbers where appropriate for qualitative data;
3. presenting quantitative data in reports;
4. selecting and using quotations, and using vignettes;
5. ways of presenting observational data;
6. combining survey responses into summary form; and
7. presenting documentary information in matrices and tables.

RECOMMENDED READINGS

Bell, J. 1999 *Doing your research project: a guide for first-time researchers in education and social science* (3rd ed.), Buckingham: Open University Press

Kane, E. 1995 *Seeing for yourself: research handbook for girls' education in African*, Washington: Economic Development Institute, World Bank

Miles, M and Huberman, A. 1994 *Qualitative data analysis* (2nd ed.), Thousand Oaks: Sage

UNIT SUMMARY

This final unit provided guidance on how to write a professional research report and how to effectively present your data and findings within the report. The issue now is taking pen to paper once you have finished you data gathering and analysis and present a solid well-structured presentation to your specific target audience. Communicating your findings will not only require you to write reports and journal articles it may also require you to present your findings at conferences and seminars where you can receive peer feedback.

FINAL ASSIGNMENT/MAJOR PROJECT

The final assignment will be decided by the instruction and/or your instructor. A recommended project is presented below.

PLAN AND CONDUCT A RESEARCH STUDY

The learner must pick a topic that is worthy of research and that access to the target population is possible during completion of the course.

The learner must:

1. Define a research topic.
2. Produce one or more research questions.
3. Produce a hypothesis.
4. Identify a target audience and research environment.
5. Produce a research proposal based on one of the examples presented in the course.
6. Based on the research proposal produce the instruments, collect the data and analyse the data.
7. Identify your research findings and recommendations based on your hypotheses.
8. Based on your research results produce a research report or journal article.

Deliverables: The research proposal and report/journal article must be submitted to the instructor for grading and feedback.

Assessment: Assessment and grading will be based on rubric produced by the instructor.

NOTE: Ideally the instructor will ask that you submit your personal journals to him or her for review and feedback. Much of what is required in the above assignment should have been brainstormed in your personal journals as your record your activity thoughts.

COURSE SUMMARY

LESSONS LEARNED

As a final personal activity you are asked to produce a list of lessons learned and to record those lessons learned in your personal journal. If possible your lessons learned should be presented to and discussed with one or more your course peers.

APPLICATION OF KNOWLEDGE AND SKILL

This course should have provided you with the foundation to plan and conduct applied research and evaluation studies that can benefit your organization and provide new ideas that can impact the learning and teaching process. Hopefully when you complete this course you will continue to grow your research and statistical methods knowledge and skills. The more methods you master the more reliable and valid your findings will be.

COURSE EVALUATION

The institution or instructor should provide a formal course evaluation at the end of the course that is submitted to department for compilation and review by a department head.

APPENDIX ONE - PROPOSAL EXAMPLE

COVER PAGE

Title of the Project: Employment of University Graduates in Sri Lanka: The Demand - Supply Nexus

Applying University: Open University of Sri Lanka

Faculty of Humanities and Social Sciences

Project Coordinator and Principal Investigator:

Prof. G.I.C. Gunawardena Senior Professor of Education Dept. of Education

Open University of Sri Lanka Nawala

Nugegoda Sri Lanka

Tel: 94-1-820032/853777 ext 407 Fax: 94-1-820032/4368584

mail: ggunawardena@hotmail.com

Co-operating Institution:

Details are being arranged with the faculty of Education of University of Stockholm. (Details are given in page 06)

PROPOSAL TO ESTABLISH A RESEARCH FUND (SIDA)

RESEARCH TEAM AND RESPONSIBILITIES

Member	Functions and time allocations
Prof. G.I.C. Gunawardena Senior Professor of Education Principal Investigator	20 % of full-time work (approximately 08 hours a day) available for planning, training, supervision and coordination of activities and writing the report
Mr. Upali Vidanapathirana Dean/ Faculty of Humanities and Social Sciences	10% of full-time work (approximately 04 hours a day) available for planning, training and supervision of activities
Dr. N.G. Kularatne Senior Lecturer, Gr. I Team member	10% of full-time work (approximately 04 hours a day) available for planning, training and supervision of activities
Dr. H.V.M. Ratwatte Senior Lecturer, Gr. II	10% of full-time work (approximately 04 hours a day) available for planning, training and supervision

ABSTRACT:

The study seeks to investigate the factors affecting graduate employment in Sri Lanka in order to determine whether 'mismatch' between education and employment exists or whether a process of 'achievement suppression' is operating in Sri Lanka. The study will examine the background characteristics, the recruitment of university and secondary school graduates, their conditions of service, and performance on the job from employers in 200 organizations.

The research will identify manner in which the background characteristics such as gender, socio-economic status, etc. influence the development of attributes desired by employers and examine the education-employment relationship from both equity and quality perspectives.

DESCRIPTION

The study will contribute to the growing body of literature in the area and also provide insights to government policy makers, educational planners and employers on reform of policies on university education, economic planning, employment generation and recruitment to employment.

RATIONALE:

Background

For more than half a century, Sri Lanka showed a great commitment to education. Education was espoused for its supposed potentialities to achieve social justice and social efficiency (Govt. of Sri Lanka, 1943). Progressive policies implemented since the 1940s such as free education up to university level, the change over to the mother tongue as the medium of instruction, the ' expansion of the education system and incentives such as scholarships, free textbooks and fee mid-day meals have effected a widening of access to education. More recently, on several occasions, education was reformed with the aim of improving its capability to 'contribute to the solutions in a rapidly and a continually changing society.

As rising expectations of social mobility cantered around education, more university places were created by establishing new universities and new campuses and by increasing the intake. Despite these measures, the percentage of the age group that gains entry to university education is restricted to a mere 2 per cent.

In late 1980s, social unrest led to a closure of universities for prolonged periods resulting in delays in university admissions. The prevalence of the war in the North and the East also had adverse consequences on resourcing of universities and as a consequence, the quality of university education has also deteriorated rapidly. Those who are selected for university have long periods' of waiting to commence their studies as well as similar long periods of waiting after graduation to obtain employment.

The insufficiency of places at the top rung of the educational ladder and the deteriorating quality of university education, have in recent times led to the emergence of an alternative structure of private higher education, parallel to state higher education. This move has been facilitated by the acceptance of open economic policies that permitted educational institutions to be established as BOI (Board of Investment) companies and the welcome extended to foreign investment in Sri Lanka. Restriction of funding of universities in developed countries such as United Kingdom and Australia also has enabled private higher education institutions to establish links with recognized foreign universities and thus offer more valued degrees than those offered by Sri Lankan state universities.

Parallel to the above developments in higher education, free market policies had a significant impact on recruitment of graduates for employment. The public sector which had absorbed the majority of university graduates in the past had shrunk to 21.5 per cent in 1990 and to 13.6 per cent in 2000. A large number of small scale business enterprises have sprung up, especially in the garments industry, which recruit graduates at executive level but it is doubtful whether a significant expansion in numbers recruited has occurred.

In the private sector, often described as the engine of growth, English is emerging as the *de facto* language used in spite of *Sinhala* and *Tamil* being continued as the media of instruction up to university level. Surveys of employers of university graduates have led to consistent findings: employers look for more than mere educational credentials. They expect an education in the broader sense, where learning is not limited to sheer book learning but entails the development of higher cognitive abilities and applicable transferable skills and personal development in which competency in English language is a prime tool. There is a widespread belief that selection for employment is not purely governed by objective criteria described above but is also influenced by family or personal contacts which is considered as closely related to the commitment of an employee to the organization. Moreover, concern is being expressed about a discernible shift from university graduate level to secondary level recruits for employment in the private sector, the justification given being the case with which the latter can be moulded to fit in with the organization s needs.

REVIEW OF PERTINENT LITERATURE

Numerous studies have probed into the effect of education on social mobility. They have shown how as greater democratization of education occurs, particularistic criteria are given priority over educational achievement. Thus consideration of such criteria as kinship or friendship (Hallak and Calloids, 1980), institutional links (Dore, 1977), political affiliation (Finlay et al, 1968; Gunawardena, 1980) or caste (Hommes and Trivedi. 1970) tends to reduce the effect of educational achievement on occupational status. In Sri Lanka, gender has often been cited as a factor-causing disadvantage in obtaining employment (SLFUW, 1980 and Jayaweera and Sanmugam, 2001). Nan and Yauger (1975) referred to this phenomenon as ***achievement suppression.***

Achievement suppression can also occur when additional criteria are incorporated into the selection mechanisms. Employers normally use characteristics of schooling such as length of schooling and examination grades as proxy indicators of productivity. However, in situations where a stagnant economy lacks the ability to absorb larger contingents of school or university graduates who have acquired educational credentials, employers tend to look for additional skills and competencies to fill the few vacancies that exist (Gunawardena, 1993).

Other interpretations of the emerging relationship between education and employment were also being put forward during this time. The mismatch between education and employment was put forward first by Dudley Seers in 1971. The Seers report (ILO, 1971) on Matching Education to Employment argued that unemployment among the educated had partly resulted from their high aspirations on entering white-collar employment and a desire for academic education. Subsequent studies (World Bank, 1991) on employer expectations indicate that employers were critical of the quality of the products of Sri Lankan secondary schools and universities. Gunawardena's study (1991) showed that employers listed communication skills, personality, interpersonal skills and general transferable skills such as adaptability, decision- making ability and organizational skills as important requirements from university graduates, which graduates lacked. These findings are confirmed by Vidanapathirana (1997).

A recent survey (Chamber of Commerce, 1999) also identified more or less the same attributes as the earlier studies. Additional attributes mentioned were the ability to head a team and achieve results in a short period, ability to prioritize/organize time productively, an open, positive, practical mind set, willingness to learn from a cross-section of people, general knowledge including world affairs, wide interests and dress sense, personal grooming and business etiquette. Specific mention is made of private business owners and managers who have difficulty in employing young graduates due to the latter's low English proficiency, inadequate practical experience and very often negative attitudes to work. Lakshman (2001) also affirmed that a mismatch exists (a) between existing labour skills and the needs of the employers as well as (b) between aspirations of those waiting for jobs and employment opportunities that are available.

Vidanapathirana (2001) however argues that more than deficiencies that occur in the quality of the graduates produced by the Universities (the supply), the basic problem lies in the demand sector, in the stagnant economy which does not create a demand for highly educated manpower.

OUTCOMES OF THE STUDY

The study would make a significant contribution to the existing knowledge on the interface between education and employment in this country. It will lead to a better understanding among the stakeholders (state, employers and university educators) of the interplay of different forces that operate in the employment market and enable them to make informed policy decisions regarding educational reform, recruitment procedures and expansion of employment opportunities.

CAPACITY OBJECTIVES

The project envisages using the services of several junior academics from the Faculty of Humanities and Social Sciences as research assistants for the study. The project will contribute to the capacity building of these academics through development of their research skills in interviewing, analysis and interpretation data and also by enhancing their motivation for research by collaboration with senior researchers. As a result of collaboration with Swedish universities, it is expected to provide the junior academics with the much-needed exposure to a research culture.

RESEARCH OBJECTIVES

The research objectives are specified in the form of research questions.

1. How many university graduates on an average per year have been recruited by different organizations during the period of last five years? How does this number compare with the number of secondary school graduates recruited by each of these organizations?

2. What is the profile of these recruits- university graduates and secondary school graduates in respect of:

    - University/higher education Institutes/ School attended?
    - Field of study
    - Competency in English language
    - Socio-economic background
    - Gender

3. What is the evaluation of employers on the quality of these recruits university and secondary school graduates regarding their

4. Commitment to the organization in terms of period of service, work attitudes, inter-personal skills etc.

5. Competency to produce the desired output related to work norms

6. What are the inducements given to these new recruits within the organization since joining, such as:

- Proposal to Establish a Research Fund (SIDA;)
- Pay rises, and other perquisites;
- Promotions; and
- Access to foreign and local training, new experiences etc.

FRAMEWORK OF ANALYSIS

The study will examine the applicability of three main theoretical perspectives related to the education-employment relationship: ***Human Capital Theory*** which postulates that investment in education leads to economic advancement both for individuals and society; ***Mismatch Theory*** which argues that unemployability is a direct result of the lack of desirable attributes in the employees; and the ***Reproduction Theory*** which explains inequity in relation to outcomes in education as a result of the operation of extraneous factors other than education, which factors suppress achievement.

The review of existing pertinent literature and the analysis of the situation prevailing in the employment market in Sri Lanka leads us to hypothesize that the theory which is most applicable to the Sri Lanka situation is the Reproduction Theory and not the other two theories.

EXPECTED RESULTS

It is expected that the study would arrive at significant findings which will demonstrate a clearer understanding of the education-employment relationship as operating in Sri Lanka.

These findings can be communicated to employer associations such as the Chambers of commerce to re-examine their recruitment policies in the light of the findings.

The findings can indicate to the university authorities the areas of reform that are imperative in curricula and teaching methodology and for improving the quality of higher education.

The findings can be communicated to university students at counselling to indicate to them the expectations of employers.

The findings can be used by national level planners in devising economic and employment planning to articulate education to employment effectively.

METHODOLOGY

Sample

As this study would effectively complement the study undertaken by the Marga Institute for the World Bank in 1991 (Gunawardena, 1991), it is envisaged to include the organizations (93 in number) in the original study. The 93 employers interviewed for the earlier study was drawn from among 25 public sector organizations, 25 semi-government organizations and 50 private sector organizations. An additional sample of 100 small business enterprises will also be included in the sample. It is expected that these employers would extend their cooperation for the proposed study also. Any who request to be left out would be substituted by new organizations from the same sector.

A purposive sample of approximately 500 employees employed in these organizations will be selected for the interview sample.

Methods of Data Collection and Analysis

The major method used for data collection would be interviews, using a semi-structured interview schedule focusing on the research questions outlined above. Where necessary, relevant documents pertaining to employment will be perused.

As the research data is primarily qualitative, methods of analyzing qualitative data such as using the *ethnograph* will be used. Additionally, frequencies and cross-tabulations will be used to bring out variations that occur in recruitment practices of employers from different types of organizations and their perceptions, requirements and evaluations.

TIME FRAME

Activity	Time Frame
Planning Sessions	January 2003
Inception Seminar	February 2003
Development of Instruments, Piloting and Finalization	February-March, 2003 March-July,2003
Interviews with HRM Directors	August, 2003
Focus group discussions with employees	September- October, 2003

BUDGET - 2003

Applying Institution

Fieldwork Costs	Local SEK
1. Minor Equipment	3,000
2. Consumables	6,000
3. Allowances	53,500
4. Travel	20,000
5.Unforeseen	7,500
Subtotal	90,000

Cooperating Institution

Fieldwork Costs	Local SEK
1. Minor equipment	9,000
2. Consumables	3,500
3. Travel	25,000
4. Salaries	15,000
5. Overheads	7,500
Sub-total	60,000
Grand Total	150,000

GENDER CONSIDERATIONS

The research team is very much gender sensitive and will ensure that gender equity is maintained in selecting the senior as well as the junior researchers. In fact, the effect of gender on employment opportunities is one of the characteristics that is being studied.

ENVIRONMENTAL CONSIDERATIONS

The research study will not have any adverse environmental effects.

ETHICAL CONSIDERATIONS

The subjects for the study are all persons with a considerable level of education who understand the value of research and the positive impact the study can have on future development of the country. The objectives of the study will be clearly explained to them before getting their concurrence for participation. They will also be assured that the information obtained from them will be treated with utmost confidentiality. As the research team consists of senior researchers with long experience in undertaking research, no problems in this regard are envisaged.

RISK ANALYSIS

The only risk factor, which can be foreseen at this juncture, is the inability of one or more team members to participate in the study due to some unavoidable circumstance. Even this factor would not have a significant bearing on the conduct of the study as the research team has worked on the proposal as a team and have sufficient experience. It is possible in such an event, to invite another research from the Faculty to substitute him/her.

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APPENDIX TWO – LITERATURE REVIEW EXAMPLE

THE CRITICAL REVIEW OF THE LITERATURE – BY BELL

An extensive study of the literature will be required in most cases for a PhD and a critical review of what has been written on the topic produced in the final thesis. A project lasting two or three months will not require anything so ambitious. You may decide to omit an initial review altogether if your reading has not been sufficiently extensive to warrant its inclusion, but if you decide to produce a review, it is important to remember that only relevant works are mentioned and that the review is more than a list of ' what I have read'.

> *Writing literature reviews can be a demanding exercise. Haywood and Wragg comment wryly that critical reviews are more often than not uncritical reviews — what they describe as the furniture sale catalogue, in which everything merits a one- paragraph entry no matter how skilfully it has been con- ducted: Bloggs (1975) found this, Smith (1976) found that, Jones (1977) found the other, Bloggs, Smith and Jones (1978) found happiness in heaven.*
>
> (Haywood and Wragg 1982: 2)

Blaxter *et al.* (1996b: 115) provide us with useful reminders about the uses and abuses of references. They suggest that you should use references to:

1. justify and support your arguments;
2. allow you to make comparisons with other research;
3. express matters better than you could have done; and
4. demonstrate your familiarity with your field of research.

They also suggest that you should not use references to:

1. impress your readers with the scope of your reading;
2. litter your writing with names and quotations;

It requires discipline to produce a critical review which demonstrates 'that the writer has studied existing work in the field with insight' (Haywood and Wragg 1982: 2), but the main point to bear in mind is that a review should provide the reader with a picture, albeit limited in a short project, of the state of knowledge and of major questions in the subject area being investigated.

Consider the following introduction to a study by Alan Woodley (1985) entitled 'Taking account of mature students'. You may not be familiar with this field of study, but does the

introduction put you in the picture? Does it give you some idea of the work that has been done already and does it prepare you for what is to follow?

Of the many who have looked at the relationship between age and performance in universities none has as yet produced a definite answer to the apparently simple question 'Do mature students do better or worse than younger students?'

Harris (1940) in the United States found evidence to suggest that younger students tended to obtain better degree results. Similar findings have been made in Britain by Malleson (1959), Howell (1962), Barnett and Lewis (1963), McCracken (1969) and Kapur (1972), in Australia by Flecker (1959) and Sanders (1961), in Canada by Fleming (1959), and in New Zealand by Small (1966). However, most of these studies were based on samples of students who were generally aged between seventeen and twenty-one and the correlation techniques employed meant that the relationships between age and performance really only concerned this narrow age band. As such, the results probably suggest that bright children admitted early to higher education fare better than those whose entry is delayed while they gain the necessary qualifications. This view is supported by Harris (1940) who discovered that the relationship between age and performance disappeared when he controlled for intelligence. Other studies have shown that those who gain the necessary qualifications and then delay entry for a year or two are more successful than those who enter directly from school (Thomas, Beeby and Oram 1939; Derbyshire Education Committee 1966).

Where studies have involved samples containing large numbers of older students the results have indicated that the relationship between age and performance is not a linear one. Philips and Cullen (1955), for instance, found that those aged twenty-four and over tended to do better than the eighteen and nineteen-year-old age group. Sanders (1961) showed that the university success rate fell until the age of twenty or twenty- one, then from about twenty-two onwards the success rate began to rise again. The problem with these two studies is that many of the older students were returning servicemen. They were often 'normal' entrants whose entry to university had been delayed by war and many had undergone some training in science or mathematics while in the armed forces. Also, while Eaton (1980) cites nine American studies which confirm the academic superiority of veterans, there is some contradictory British evidence. Mountford (1957) found that ex-service students who entered Liverpool University between 1947 and 1949 were more likely to have to spend an extra year or more on their courses and more likely to fail to complete their course.

Some studies have shown that whether mature students fare better or worse than younger students depend upon the subject being studied. Sanders (1963) have indicated that the maturity associated with increasing age and experience seems to be a positive predictor of success for some arts and social science courses. The general finding that older students do

better in arts and social science and worse in science and maths is supported by Flecker (1959), Barnett, Holder and Lewis (1968), Fagin (1971) and Sharon (1971).

Walker's (1975) study of mature students at Warwick University represents the best British attempt to unravel the relationship between age and performance. He took 240 mature undergraduates who were admitted to the university between 1965 and 1971 and compared their progress with that of all undergraduates. This gave him a reasonably large sample to work with and the timing meant that the results were not distorted by any 'returning servicemen factor'. His methodology showed certain other refinements. First, he excluded overseas students. Such students tend to be older than average and also to fare worse academically (Woodley 1979), thus influencing any age/performance relationship. Secondly, he used two measures of performance; the proportion leaving without obtaining a degree and the degree results of those taking final examinations. Finally he weighted the degree class obtained according to its rarity value in each faculty.

The following findings achieved statistical significance:

1. In total, mature students obtained better degrees than non- mature students.
2. In the arts faculty mature students obtained better degrees than non-mature students.
3. Mature students who did not satisfy the general entrance requirements obtained better degrees than all other students.
4. The degree results of mature students aged twenty-six to thirty were better than those of all other mature students.

Several other differences were noted but they did not achieve statistical significance due to the small numbers involved. The mature student sample only contained thirty-three women, twenty-six science students and thirty-seven aged over thirty. The aim of the present study was to extend Walker's work to all British universities so that these and other relationships could be tested out on a much larger sample of mature students.

This review is more thorough than would normally be required for small projects, but the approach is much the same, whatever the exercise. Alan Woodley selects from the extensive amount of literature relating to mature students. He groups certain categories and comments on features which are of particular interest.