

Nursing 3220 The Use of Computers in Nursing Research

PART 1:

Applying Technology and Informatics to the Nursing Research Process
<p>A. Research Problem, Purpose, Main Question or Hypothesis</p>
<ul style="list-style-type: none"> • The Internet and Electronic Research Databases provide access to a large portion of the existing Quantitative and Qualitative literature. This provides foundational data, theory, and research findings to help shape your Research Purpose and investigate your selected Problem in depth. By examining the literature, you can begin to identify the gaps in the literature which can help you to formulate your primary research question(s) and/or hypotheses. • Exploring Online Research Methods in a Virtual Training Environment http://www.geog.le.ac.uk/orm/site/home.htm Excellent step by step overview of the process of using the online environment for research.
<p>B. Literature Review</p>
<ul style="list-style-type: none"> • The Literature Review phase of the research process is also facilitated by this initial search, since a large amount of full text research papers and articles are available through these Electronic Research Databases. Access through these databases is usually achieved through academic and health organizations or through personal or group subscriptions. Examples include CINAHL, Academic Search Premier, EBSCO, MEDLINE, PsychINFO. And JSTOR. • There are also some open access databases available on the Internet such as the DOAJ – Directory of Open Access Journals at http://www.doaj.org/
<p>C. Conceptual Framework</p>
<ul style="list-style-type: none"> • Visual display software can be used to create a visual representation in the form of concept maps, flow charts, or visual models of your research conceptual framework (either qualitative or quantitative). This helps you to accomplish three results: a) to visually represent your main concepts and sub-concepts to organize and guide the research process planning b) to visually explain your research proposal to reviewers and funding agencies and c) to illustrate the conceptual framework that emerges from your data, especially in qualitative research. <p style="background-color: #ccffff; margin-top: 10px;">Visual Software for Concept Mapping</p> <ul style="list-style-type: none"> • CmapTools version 4.03 for Windows - Open source software for concept mapping and knowledge sharing, available at http://cmap.ihmc.us/download/index.php?myPlat=Win • Freemind – Open source JAVA powered software for mind mapping. Maps can also be published freely online through the site's WIKI. http://freemind.sourceforge.net/wiki/index.php/Main_Page

Applying Technology and Informatics to the Nursing Research Process

- **Conzilla – The Concept Browser**
<http://www.conzilla.org/wiki/Overview/Main>
 This JAVA based, open source, versatile knowledge management tool allows you to create context maps to brainstorm conceptual frameworks, organize and share work and other brainstorming activities.
- **DeepaMehta -** <http://www.deepamehta.de/>
 Another JAVA based, open source knowledge management system that allows you to organize pieces of your research as concept maps, share files with others, and supports various phases of the research process.
- **Inspiration –** <http://www.inspiration.com>
 An easy to use concept mapping and visual display software (cost is about \$70).
- **Smart Draw –** <http://www.smartdraw.com/>
 This software creates complex visual displays of all kinds, including concept and mind maps, brainstorming displays, flow charts, and network diagrams (cost is about \$200).

D. Research Design

QUANTITATIVE

Computer programs, new technologies, and the Internet can be used both to facilitate research design planning and data collection, as well as provide the context for a research study. Wordprocessing, spreadsheet and database programs can all be applied to plan the study. Examples of how technology can supply the context for a study are outlined below.

Experimental – An experimental and control group can be randomly selected to participate in a study focused on the effectiveness of a relaxation multimedia program on learner retention. The control group would view an alternate multimedia program that was not designed to promote relaxation. Both groups could then be tested using the same identical learning tool to test retention.

Quasi-Experimental – A group of students could be selected to participate in a videoconference that outlined the principles of health promotion. The group would be selected using convenience sampling, and given a pretest before the videoconference, and a post-test after they had participated in the conference. The before and after scores could then be analysed for changes in the class' retention of the content.

Non-Experimental – An exploratory survey design could be used to investigate nursing faculty's experiences with teaching online courses. The survey could be uploaded to a web server so that participants could complete it online.

Applying Technology and Informatics to the Nursing Research Process

QUALITATIVE

Phenomenology - An educator could plan to conduct individual interviews with a small cluster of peer participants to explore their personal experience of integrating technology into their teaching.

Grounded Theory - A researcher could plan a study to develop theory about the communication processes that emerge during asynchronous discussion forums between instructors and students.

Ethnography – A researcher could join an online community to study the cybercultural patterns of interaction and relationship building.

Feminist – A researcher could explore the experiences of women who are launching web design businesses.

Action Research – A student could plan an initiative to explore the needs of single mothers, using both a face-to-face meeting and online support community approach to planning and action decisions.

E. Sample Type, Description, Selection

QUANTITATIVE SAMPLING

Random Sampling- Cryptographically secure random number generators such as Fortuna or Yarrow can be used to generate true random number selection to facilitate an unbiased random sample selection for experimental and quasi-experimental studies.

Fortuna: <http://www.codeproject.com/cpp/FortunaCSI.asp>

Yarrow: <http://www.schneier.com/yarrow.html>

QUANTITATIVE OR QUALITATIVE SAMPLING

Non-probability Techniques

Purposive Sampling – An educator could apply their own discretion or judgment to invite particular students to participate in an online focus group to discuss their Web Quest experiences.

Convenience Sampling – A nurse could ask clinic patients to participate in a web based eMonitor study to assess their monthly blood pressure from their home.

Snowball Sampling - Forms to petition online survey participants to invite a friend to also participate in the study could be designed to increase the sample size.

Applying Technology and Informatics to the Nursing Research Process

F. Research instruments and Data Collection

Computer programs, the Internet and other technologies can also be used to both create and/or implement a research instrument in both quantitative and qualitative research.

Surveys – E-mailed or online surveys can be mounted online using web forms or other software so that participants can complete them and send them to the researcher instantly. This often elicits a much higher return rate than mailed-out surveys. Software can also be used to create surveys that are completed in person or printed for mail-out.

- **WebSurveyor** <http://www.websurveyor.com/gateway.asp>
This is an online survey development and data collection tool that helps professionals easily design email, web-based, and poll types of surveys for research purposes. This software is expensive, but may be accessible through some educational and other institutions.
- **PhpESP – Easy Survey Package** <http://sourceforge.net/projects/phpesp/>
This is an open source PHP script that can be uploaded to a web server to provide online survey development capabilities.
- **LimeSurvey** - <http://www.limesurvey.org/>
This is another open source PHP script based survey development software that can be freely used to develop web based surveys for research and viewer input.
- **Likert Scaling** - <http://www.socialresearchmethods.net/kb/scallik.htm>
An easy to understand overview on how to create likert-scale surveys for paper or web based nonexperimental designs.

Physiological Monitors

- **Patient eCare eMonitor Interface** <http://www.patientecare.com>
This web based interface helps connect patients and caregivers by setting up home based eMonitor equipment (via the serial port of the patient's computer) such as Blood Pressure, Weight, Peak Flow, or Glucose eMonitors. Readings from the monitors are then recorded into the software, which could be used in research focused on client experiences or the effectiveness of telenursing, etc.
- **Biofeedback Devices** <http://www.bio-medical.com/>
Biomed.com profiles a number of technical monitors and software that can be used in research focused on various physiological and psychological data measures.
- **WHMS – Wearable Health Monitoring Systems** <http://www.ece.uah.edu/~jovanov/whrms/>
A thorough introduction to these new technologies that promise to become invaluable ways to

Applying Technology and Informatics to the Nursing Research Process

monitor physiological measures, and provide data for research.

Interviews

The use of computers to facilitate interviews is becoming quite common, through the use of chat rooms, forum like settings, “talking” computers that use Flash based, narrative led interviews, and web video recorded sessions. Researchers find these type of interviews very suitable when exploring sensitive issues such as violence, sexual behavior, maltreatment, and interpersonal interactions.

- **Snap PDA Interviewer** - <http://www.snapsurveys.com/software>
This mobile interviewing software facilitates face-to-face interviews by allowing the researcher to unobtrusively use the PDA as a research instrument to collect answers to the interview questions.

G. Legal and ethical considerations

Informed Consent

All research, including computer assisted or focused research must include the means to provide enough information to research participants to agree to give informed consent before being involved in the study. The actual consent form can be created on a computer using a wordprocessing program. It can also be included as a downloadable file through email or the Internet.

- **Office for Health and Human Services, Office for Human Research Protections**
<http://www.hhs.gov/ohrp/>
This site provides comprehensive information on how to acquire properly informed consent from research subjects and participants.
- **Sample Consent Form for a Web-Based Study**
<http://www.socialpsychology.org/consentform.htm>
Social Psychology Network provides a sample form to help demonstrate the critical elements and techniques to use to gather informed consent from participants who partake in online surveys, interviews or other research studies.
- **Ethical and Legal Aspects of Human Subjects Research on the Internet**
<http://www.aaas.org/spp/sfirl/projects/intres/report.pdf>
This report is a cumulation of the discussions from a conference workshop held in Washington, DC in 1999 and sponsored by the U.S. Office for Protection from Research Risks.

Applying Technology and Informatics to the Nursing Research Process

Confidentiality and Data Security

A key consideration of all research studies is the issue of participant confidentiality and security of all collected data, both demographic and study related. When computers are used to collect the data, this issue becomes even more critical, since potential illegal access to the information becomes more likely.

- **Improving Access to and Confidentiality of Research Data: Report of a Workshop** <http://www.nap.edu/catalog/9958.html#toc>
The National Academies Press offers this online book free for viewing and download.
- **eHealth Code of Ethics** - <http://www.ihealthcoalition.org/ethics/ehcode.html>
Designed by the eHealth Ethics Initiative, this International Code of Ethics was created to guide researchers and eHealth providers in the process of ensuring confidentiality and data security.

H. Data Analysis methods

One of the most profound influences that technology has had on research is in data analysis applications. Literally hundreds of hours can be saved by using the appropriate analysis software in both quantitative and qualitative research. More rigorous testing can be achieved plus a huge reduction in analyst error.

QUANTITATIVE STATISTICS

- **SPSS** – <http://www.spss.com/spss/>
This software has been considered the premier non/parametric data analysis software for several decades. Once available only by main frame computer, PC versions are now available. Examples of statistics that can easily be calculated: Chi Squares, Correlation, T Tests, and Analysis of Variance (ANOVA).
- **Web based Calculators – Vassar Stats** <http://faculty.vassar.edu/lowry/VassarStats.html>
A variety of web based programs are now available on the Internet for calculating various quantitative data sets. By far, the prime site for this is Vassar Stats, created by Richard Lowry, a psychology professor at Vassar College in New York. Robust java based calculators quickly analyze Chi Squares, T Tests, Correlation, Z tests, and ANOVA tests from anywhere that web access is possible.

QUALITATIVE ANALYSIS

Applying Technology and Informatics to the Nursing Research Process

- **QSR's N6 and NVitro** - http://www.qsrinternational.com/products/productoverview/product_overview.htm
QSR, an Australian company offers two elite qualitative analysis software packages particularly suited to analyzing phenomenological, action, grounded theory, and mixed methods data.
- **WEFT QDA** - <http://www.pressure.to/qda/>
This Open Source qualitative analysis tool works much like N6 above, but in a simpler, more straightforward manner. It is free to use, and allows the research to organize narrative and interview data into themes, matrixes, frequency counts, and to apply boolean queries.
- **AtlasTi** - <http://www.atlasti.com/>
This “knowledge workbench” software is excellent for analyzing text, video, and audio and other multimedia qualitative data.
- **HyperResearch 2.6** <http://www.researchware.com/?gclid=CObppvTO6YgCFSZmYwodhVuSow>
This software also analyzes both text and multimedia data, enabling the researcher to code, retrieve, theorize, and conduct data analyses.

I. Discussion of Findings, Recommendations, Implications, Limitations, Summary

Preparing Tables and Visual Data Displays, Publishing, Presentations

Word processing software like Microsoft Office or the open source software, Open Office can be used to create text documents, spreadsheets, tables, graphs and charts as well as Powerpoint presentations for preparing tables and visual displays of the research study findings.

- **Open Office** - <http://www.openoffice.org/>
This robust, free, office suite includes all of the features of other more expensive office suites, plus is compatible with all of them (e.g. Can export files as a Word document) and allows you to publish your files as PDFs without buying a PDF converter.
- **Writer's Block** - <http://www.writersblocks.com/wb3download.htm>
This software is meant to help researchers organize their findings into blocks of text to help with the final writing in a clear and logical way.

J. Budget

An important part of any research proposal is an accurate and easy to follow budget, especially when the researcher is seeking funding. Various spreadsheet software can help with this, including the

Applying Technology and Informatics to the Nursing Research Process

spreadsheet available in Open Office (listed above) or Microsoft Excel that comes with MS Office. As well, budget software such as Quicken can also be useful for this part of the research process.

Spreadsheet Add-Ons

- **NSF Budget Calculation Sheet** for Excel or Open Office
http://durango.research.usf.edu/images/uploads/NSF_Budget.xls
 This worksheet can be downloaded and imported into either Excel or Open Office to assist researchers to calculate the proposed research budget.
- **OSG Sample Budget Calculation Sheet** for Excel or Open Office
http://www.research.uh.edu/Online_Forms/OCG_Sample_budget.xls
 Another sample worksheet that can be imported into Excel or Open Office spreadsheet software.

K. References and Bibliography

Researchers often use style and databased software to help them to organize their reference resources and to format their reference and bibliography lists correctly using the common citation styles such as APA or Chicago Style.

- **End Note X** <http://www.endnote.com/>
 This popular bibliographic software is used by many academic institutions and researchers to provide a robust reference database. Also helps you to import citations into Microsoft Word when writing the research paper or proposal.
- **Biblioscope Research Information Manager** <http://www.biblioscope.com/>
 Another software package for organizing research and paper citations and reference data.

Style Guide Aids

- **Microsoft Office (or Open Office) APA document template**
<http://www.uwsp.edu/psych/APATemplate.doc>
 This downloadable Word document (doc) can be imported to Word or Open Office to guide the researcher in writing a research report using APA 5th edition style.
- **MLAGEN - MLA Auto-Generator** <http://mlagen.sourceforge.net/>
 This freeware bibliographic program helps to apply the MLA Style to documents and references.

References

- Canadian Nursing Informatics Association (2003). *Educating tomorrow's nurses: Where is Nursing Informatics?* Retrieved from the World Wide Web 07/18/05 from <http://cni.ca/OHIHfinaltoc.htm>
- Canadian Nurses Association. (2000). *Vision 2020 Workshop on Information and Communications Technologies in health care from the perspective of the nursing profession*. Ottawa: Author.
- College of Registered Nurses of British Columbia. (2006). *Entry-level Registered Nursing practice: Competencies and Context*. Vancouver: Author.
- Dick, B. (1997). *A naive philosophy of action research*. <http://www.scu.edu.au/schools/gcm/ar/arp/naive.html>
- Staggers, N., & Bagley Thompson, C. (2002). The evolution of definitions for nursing informatics: A critical analysis and revised definition. *Journal of the American Medical Informatics Association*, 9(3), 255 – 262.
- Streubert Speziale, H. & Carpenter, D. (2003). *Qualitative Research in Nursing: Advancing the Human Imperative*. Philadelphia: Lippincott.